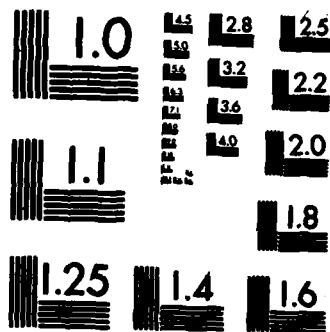


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Service Evaluation of Airborne Tire Pressure Indicating Systems

AD A127220

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Prepared By
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December 1982

Final Report

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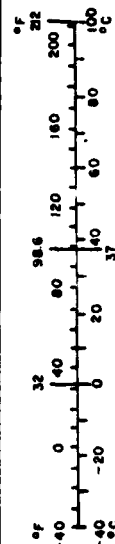
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
ac	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
cup	teaspoons	5	milliliters	ml
fl oz	tablespoons	15	milliliters	ml
qt	fluid ounces	30	milliliters	ml
pt	gallons	0.24	liters	l
qt	quarts	0.47	liters	l
gal	gallons	0.95	liters	l
ft ³	cubic feet	3.8	liters	l
yd ³	cubic yards	0.03	cubic meters	m ³
		0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
km	kilometers	1.1	yards	yd
		0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.5	acres	ac
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	st
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
		1.06	quarts	qt
		0.26	gallons	gal
m ³	cubic meters	26	cubic feet	ft ³
		1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



* 1 in = 2.54 (exact). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Length and Measures, Price \$2.25, SO Catalog No. C13.10.286.

PREFACE

This study was conducted by Douglas Aircraft Company (DAC), a division of McDonnell Douglas Corporation, and the Swissair company, Swiss Air Transport Company, Ltd. This was a combined effort to access the in-service performance and utilization of a cockpit tire pressure indication (TPI) system. This report was prepared from results of the study by DAC under a contract for the Federal Aviation Administration of the Department of Transportation. Technical monitor for the Federal Aviation Administration was Mr. Richard Johnson, FAA Program Manager. Technical monitors for Swissair were Mr. Rolf Buhler, Mechanical and Hydraulic Systems, and Mr. Gion Caprez, Electronics and Electrical Systems. In addition, the diligent efforts of all involved Douglas and Swissair personnel in support of this test program are greatly acknowledged. The data used in this report were derived from the Swissair year-long in-service testing evaluation.



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ABBREVIATIONS

ac	alternate current
A/D	analog to digital (data conversion)
APU	auxiliary power unit
A/S	antiskid
ATR	air transport rack
AUH	Abu Dabi
BCD	binary code digit
BKK	Bangkok
BITE	built-in-test equipment
BOM	Bombay
BOS	Boston
BTMS	brake temperature monitoring system
BTM/TPI	brake temperature monitoring/tire pressure indicating
°C	degree Celsius
CAC	center accessory compartment
C/B	circuit breaker
CMOS	Complementary metal oxide semiconductors
CPU	central processing unit
dc	direct current
DHA	Dhahran
DIFF TEMP	differential temperature
DKR	Dakar
EMI	electromagnetic interference
FAA	Federal Aviation Administration
FIH	Kinshasa
FLT	flight
FUS	fuselage
g	acceleration of gravity (32.2 ft/sec ²)
GIG	Rio de Janeiro - International Airport
GRD	ground
GVA	Geneva
Hz	Hertz
JED	Jeddah
KHI	Karachi
kHz	kiloHertz
L	lift
LOS	Lagos
Manip	milliampere
NCE	Nice
NL	nose left
NR	nose right
OAT	outside air temperature
OATP	on-aircraft test procedure
ORD	Chicago - O'Hare Airport
OVHT	overheat
PC	printed circuit
P/N	part number

(Cont.)

ABBREVIATIONS

PRESS	pressure
PSI	pressure unit, pounds per square inch
R	right
RTO	rejected takeoff
RTV	room temperature vulcanizing
SCL	Santiago, Chile
SIN	Singapore
TEMP	temperature
TIFF	Swissair engineering department
T.O.	takeoff
TPI	tire pressure indicating
VCP	Sao Paulo, Brazil - Veracopos Airport
vdc	volts, direct current
ZRH	Zurich

EXECUTIVE SUMMARY

SUBJECT: Service Evaluation of Airborne Tire Pressure Indication Systems

PURPOSE: The purpose of this study was to evaluate the in-service performance and utilization of a Goodyear and Fairchild tire pressure indicating (TPI) system as installed on two Swissair DC-10 aircraft (AVS-1 request dated December 12, 1980).

BACKGROUND

This contracted study by the Douglas Aircraft Company represented an outgrowth of an FAA funded research program to assess the safety benefits of cockpit installed tire pressure indicating systems. Two previous reports were made available from this program effort: FAA-RD-78-134, I dated October 1978, "Feasibility and Cost Effectiveness of Airborne Tire Pressure Indicating Systems" and FAA-RD-78-134, II dated September 1979, "Flight Test Evaluation of Airborne Tire Pressure Indicating Systems." The specific intent of this study was to support rule recommendations applicable to the installation of TPI systems on large transport airplanes (Notice 79-20, Docket 19793).

ABSTRACT

Results of the in-service evaluation on tire pressure indicating systems are reported in this document. Two systems, one made by Goodyear and the other by Fairchild, were evaluated on two McDonnell Douglas DC-10's from March of 1980 to May of 1981. The Goodyear system employs the copper-graphite-copper journal bearing technique while the Fairchild system uses the inductive coupling (air gap transformer) method. A detailed test evaluation is included for each of the systems tested. Based on the in-service performance, the Fairchild system was selected as the production system. The first installation was completed at Long Beach in early 1982. FAA certification of Fairchild system was completed also in early 1982 with FAA Type Design approval granted for use on the DC-10-30 on February 22, 1982.

RESULTS

The Goodyear and Fairchild TPI systems were evaluated on in-service DC-10 aircraft with each system providing satisfactory results. The Goodyear system was exposed to 1000 landings and 4000 flight hours; the Fairchild system was exposed to 1500 landings and 5000 flight hours. In view of several false readings associated with the Goodyear system, the Fairchild system proved to demonstrate higher accuracy and reliability. The overall testing experience provided a basis for perfecting the TPI systems for production usage on transport aircraft.

INTRODUCTION

Since 1977, Douglas Aircraft Company has been the principal investigator of the tire pressure indicating system study which was funded under a Federal Aviation Administration (FAA) contract. Two reports were made available from this study: FAA RD78-134,I dated October 1978, "Feasibility and Cost Effectiveness of Airborne Tire Pressure Indicating Systems" and FAA RD78-134,II dated September 1979, "Flight Test Evaluation of Airborne Tire Pressure Indicating Systems." Based on the positive results of the previous tire pressure indicating (TPI) system studys, Douglas Aircraft Company decided to conduct an in-service test on two potential production systems to prove feasibility for a production TPI system. The Swissair company, with operational experience, provided Douglas with a full support in-service evaluation of the Goodyear and Fairchild TPI systems, conducted on two DC-10 aircraft. This report documents the results of the in-service test which began in February 1980 and completed in May 1981. It also describes the production TPI system for the DC-10 aircraft.

EVALUATION OF SELECTED SYSTEMS

SUMMARY OF EXPERIENCE

Since 1977, tire monitoring systems that display the tire condition in the cockpit during ground and flight operations have been being evaluated for their potential effectiveness for commercial transports. Both Goodyear and Fairchild worked with Douglas to develop prototype TPI systems which provided DC-10 flight crews with a continuous, in-cockpit indication of tire pressure in all aircraft operating regimes. During different flight test evaluations, both companies introduced improved concepts which performed tire monitoring and display effectively. Concepts were fully developed in the

laboratory and successfully tested on aircraft wheels, with accuracy demonstrated.

After numerous tests, an in-service evaluation program was planned. With the support of Swissair, both Goodyear and Fairchild provided a preproduction TPI system which involved different concepts. The systems to be tested were as near production configuration as possible. After the successful installations, Swissair began to obtain service data throughout the winter and summer seasons to enable a complete evaluation of the systems' reliability under the extremes of different environmental conditions.

GENERAL SYSTEM DESCRIPTION

The Brake Temperature Monitoring/Tire Pressure Indicating (BTM/TPI) system is designed to warn the flight crews of overheated brakes or underinflated tires that might cause problems after pushback during taxi-out or takeoff roll. Warnings and indications of such problems are provided during all phases of flight. With these warnings, corrective action can be taken by maintenance crews before the problem occurs. Due to the limited space in the flight engineer's panel, the preproduction TPI system was combined with the existing (BTM) system called the BTM/TPI system.

The Goodyear preproduction BTM/TPI system is a digital, microprocessor-controlled system. The tire pressure is sensed through individual pressure transducers which develop a direct current signal proportional to tire pressure. This dc signal is obtained as the voltage drop across the copper-graphite-copper journal bearing rotating conductor and the pressure transducer resistance. The voltage drop occurs when a wheel-mounted variable-resistance type pressure transducer is driven by a constant precision current which is being sent to the wheel through the journal bearing assembly. This

assembly is installed inside the already existing antiskid wheel speed transducer, and is driven by the transducer shaft. A wire is brought from the pressure transducer to the hubcap where the electrical signal enters through a two-pin connector mounted on the periphery and is transmitted to the connector plug via shielded wiring. The electrical path is completed through the journal bearing assembly. The signal is brought up to the system computer for signal processing.

The Fairchild preproduction BTM/TPI system utilizes the 52-kHz power signal which is sent to each wheel across the inductive coupling (air gap transformer). It is then received by the wheel electronics. The wheel electronics converts the 52 kHz to a regulated +10 volts, direct current to power the wheel electronics circuits and the wheel-mounted pressure transducer. The pressure transducer converts pressure value to an electrical analog voltage which, in turn, is converted to a frequency by the voltage-to-frequency converter on the wheel electronic board. The return frequency across the inductive coupling is generated by shorting half the coil at the required frequency. This signal then appears at the computer as a reflected impedance change and is sensed by the current detector located on the wheel select board. The signal is then fed to an envelope detector, converted to a square wave, and then sent to the system computer for conversion to the pressure value. This number is also sent to the cockpit display panel on demand.

The brake temperature sensor for the preproduction systems is identical to the sensor used in the present BTM system on the DC-10. The Goodyear brake temperature sensor, P/N 6001156, has been used successfully on the DC-10 aircraft since 1973. The sensor has been environmentally and field service tested. It is constructed with a platinum wire sensing coil encased in a metal bulb at the sensing end, supported and tied to an electrical connector. Tubing, with lead wires supported inside by metal oxide insulation, fastens to the connector support housing at one end and to the sensor bulb at the

other. The sensor is supported in the brake with a clamp nut holding the housing and a slotted tube supporting the sensing bulb.

In the preproduction BTM/TIP systems, the brake temperature sensors are multiplexed with a constant current source of 5 milliamperes and the voltage change with temperature is measured by the computer. The voltage is then processed through an analog to digital converter and the resulting number is fed to the computer. The BTM/TPI computer then processes this temperature number and sends it to the cockpit display panel on demand. Moreover, both tire pressure and brake temperature signals are processed by the system computer in accordance with instructions stored in the computer memory and then transmitted by means of a serial data line to the cockpit display panel for display to the flight crew.

The preproduction cockpit display panel contains electronics to activate different functions. A seven-segment incandescent thin-wire digital display provides the actual values of both brake temperature and tire pressure. There are dual function switches indicating overheated brake (OVHT) and low-pressure tire (LOW) for each individual wheel. The nose wheel is not equipped with a braking system; therefore, only low tire pressure warnings can be given.

Since the actual value for the brake temperature can be provided, it is a common practice to check the brake temperature before the initial takeoff. The brake temperature can increase dramatically due to differential braking on a long taxi-out. The higher the brake temperature, the less the brake is capable of stopping the aircraft during for a rejected takeoff (RTO). As a result, knowledge of the brake temperature will provide advanced information on braking performance in the case of RTO. If any brake temperature exceeds 400° C, the OVHT warning indication will illuminate. This temperature limit was selected on the basis of laboratory tests which showed a degradation of performance when brakes were operated beyond 400° C.

A brake can drag when the braking mechanism malfunctions. This will cause heat to build up during nonbraking periods, and a higher temperature displayed than for the other brakes. This could cause a blown tire and bearing fire within the wheel well. A DIFF TEMP feature is included in the cockpit display panel to indicate a malfunctioning brake or improper brake control procedures. It provides a warning indication if any brake exceeds an allowable deviation above or below the average temperature. As a result, any dragging brake or inoperable brake can be discovered ahead of time and may enable timely corrective action to be taken. This will prevent unnecessary brake wear and ascertain that energy is evenly distributed among the brakes.

The tire pressure value can be obtained by putting the system in the pressure mode. A low tire pressure warning light will illuminate if any tire is below the preset low tire pressure threshold. This will identify a tire problem so that the flight crew can prepare for corrective action. In addition, the low tire pressure warning will be triggered when the preset differential pressure between any tire and its axle mate is exceeded. Tire inflation pressure is critical in today's multiwheel aircraft because of their high gross weight. With the aircraft flying at record high gross weights, the weight carried per tire is very close to the maximum allowed rating. One tire underinflated means the tire on the same axle will have to carry the additional load. Also, the proper inflation is not obvious on a walk-around inspection. It is not sufficient to know if the tires are correctly inflated when leaving the ramp. Further, debris on the runway could introduce tire failures while the flight crew is unaware of the developing tire pressure problem. Therefore, by monitoring tire pressure and issuing warnings at all times, a potential tire problem can be avoided.

The BTM/TPI system makes extensive use of low-power, high-noise immunity components. The electronics are primarily complementary

metal oxide semiconductors (CMOS). This results in low aircraft power requirements, less heat dissipation, enhanced reliability, and less weight for the electronics.

GOODYEAR SYSTEM COMPONENT DESCRIPTION

One of the primary concerns of the airlines on TPI systems is to minimize the number of false warnings. A microprocessor-based system with analog data processing capability will provide maximum rejection of false warnings. The Goodyear BTM/TPI system utilizes microprocessor technology to analyze the signals. A predetermined, inflexible high-low limit can be set so that all tire pressures can be compared against these limits which are established from operator in-service tire performance data. This advanced technology involves complex components as described below:

1. Wheel component kit - Consists of a pressure transducer assembly installed in a banjo fitting. This fitting is located at the valve port where the pressure release plug was formerly located. The banjo fitting is a universal type which may be positioned axially to allow for tolerance in mounting the pressure transducer. A saddle clamp mounts the pressure transducer to a bracket supported by two wheel bolts.

The pressure transducer is a potentiometer type absolute pressure transducer, as illustrated in Figure 1. It is connected to a two-pin electrical connector plug by a fixed length of wire running from each J-hook to a plug pin. The wires are covered by a metal overbraid which is attached to both the transducer and connector housings with a stycaast potting molded in the shape shown in Figure 2. The overbraid and potting form a strain relief for the soldered wire joints and provide protection from the hostile environment. Internally, the pressure transducer contains a potentiometer driven by a Bourdon tube actuator. The electrical resistance of the transducer varies with

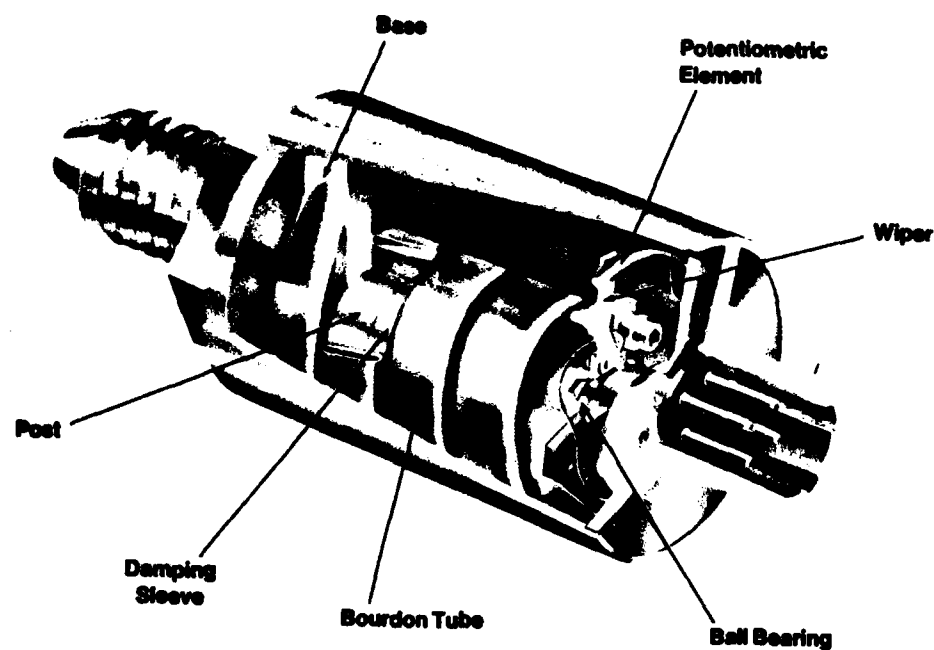


FIGURE 1. GOODYEAR PRESSURE TRANSDUCER

applied air pressure. Therefore, when a constant current is applied across its sensor, the voltage output of the transducer will also vary

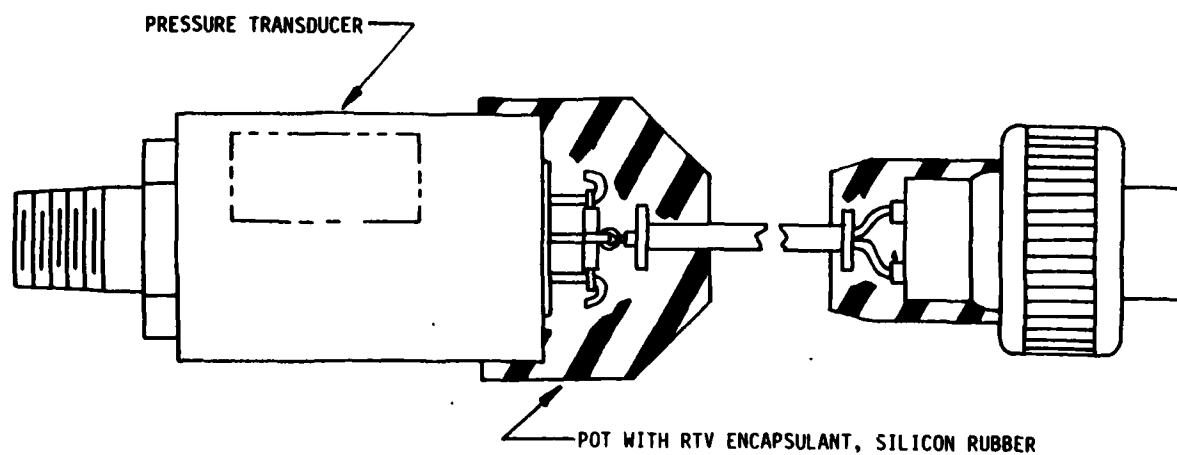


FIGURE 2. INTERNAL VIEW OF GOODYEAR PRESSURE TRANSDUCER ASSEMBLY

with pressure. A plot of tire inflation pressure versus transducer output is shown in Figure 3.

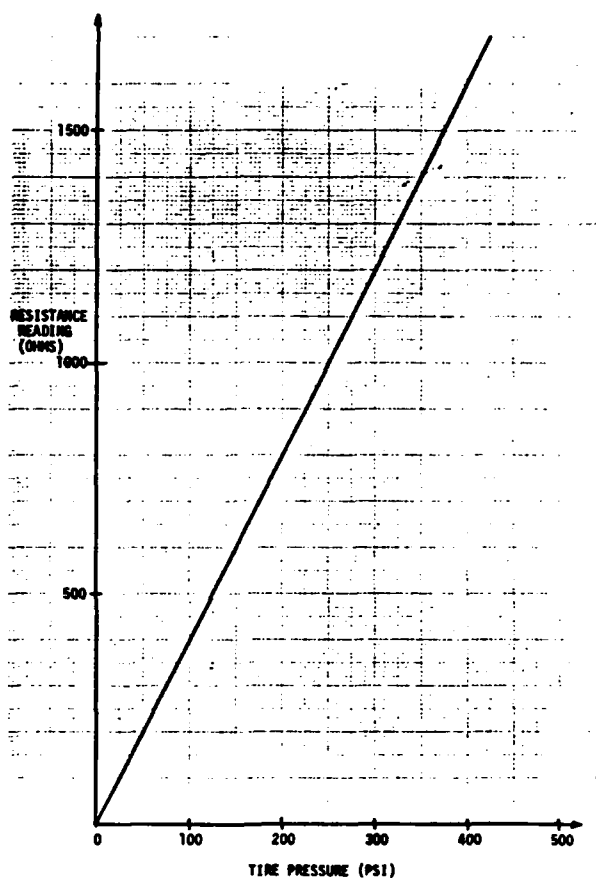


FIGURE 3. TIRE PRESSURE VERSUS PRESSURE TRANSDUCER OUTPUT (GOODYEAR)

2. Drive cap - The hubcap assembly acts as an electrical interface between the pressure transducer and the axle coupler, and a mechanical interface between the wheel and the antiskid wheel speed transducer. The electrical signal from the pressure transducer enters the hubcap through a two-pin connector mounted on the hubcap. The signal is transmitted to a two-pin connector plug via shielded wiring. When the hubcap coupling is engaged with the drive arm of the axle coupler, it

becomes the driver for the transducer armature and provides an electrical mating of the connector plug with a female connector, which is mounted on the driven arm and directly leads to the axle coupler. The plug assembly has a spring on its underside which exerts a suitable mating force on the two pins to ensure that proper electrical continuity is maintained. The coupling and plug assembly are also designed to float in a manner which will compensate for any misalignment between the axle centerline and hubcap centerline that may arise during and after installation. The drive cap is mounted on the main wheels using the existing friction fit by a Mormon-type vee clamp.

3. Axle coupler - The axle coupler for the main wheel is a modified antiskid wheel speed transducer. The existing antiskid wheel speed transducer has been reworked to enable the electrical signal to be transmitted. It includes the driven arm subassembly and the rotating conductor assembly, shown in Figure 4. These subassemblies mount on

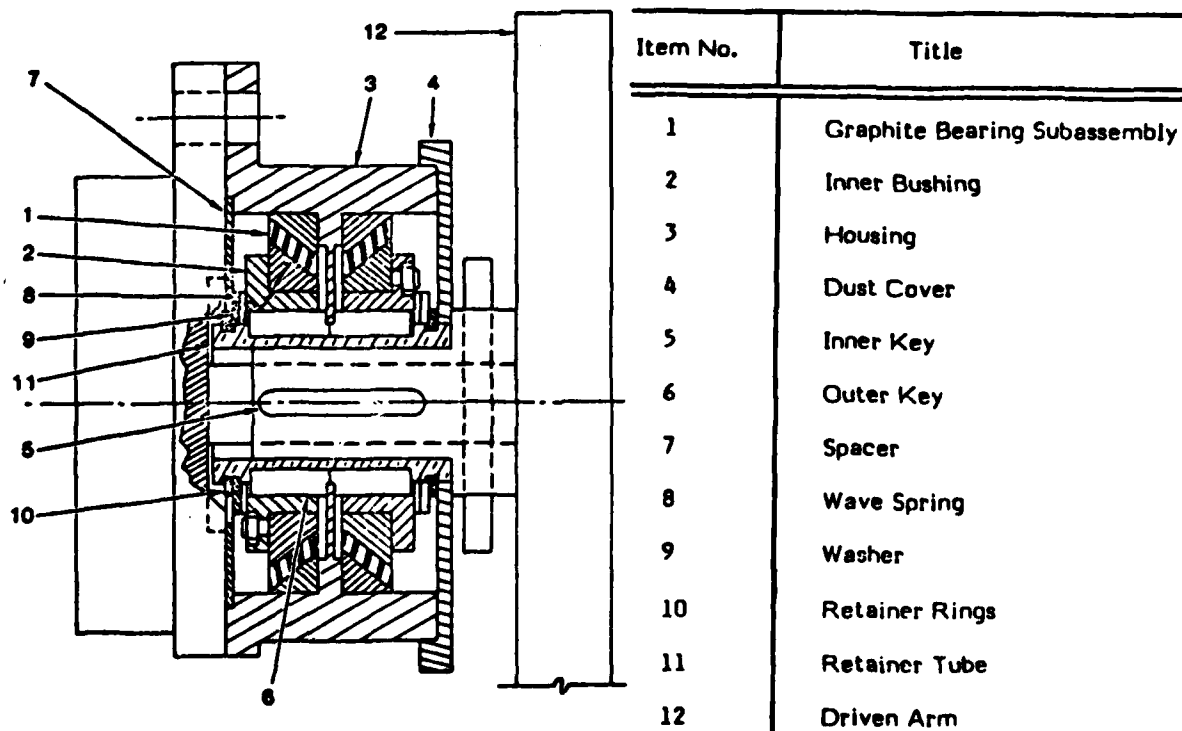


FIGURE 4. GOODYEAR AXLE COUPLER (ROTATING CONDUCTOR) ASSY

the antiskid transducer shaft between the housing flange and the driven arm. The driven arm subassembly consists of the present antiskid wheel speed transducer drive arm which has been modified to include a receptacle backing plate. The plate contains two female connectors that wire back directly to the rotating conductor. The nonrotating wires from the rotating conductor are routed back through the antiskid housing and are soldered to the connector pins.

The rotating conductor assembly features a housing that surrounds the two graphite bearings and separates them into two isolated compartments. This provides a physical and electrical insulation for the bearings against the neighboring hardware and environment. Each bearing consists of an annular graphite sleeve surrounded by a nonrotating copper outer race and a rotating copper inner race. The nonrotating member is mounted in the antiskid wheel speed transducer housing while the rotating member is driven by the existing antiskid wheel speed transducer shaft. This inner race rotates at the same speed as the aircraft. The graphite sleeve rotates at the same speed as the wheel, at lower speeds, or not at all. The outer race and the housing do not rotate. A wave spring provides an axle bearing preload pressure of 6 pounds per square inch which is the optimum value for minimizing wear of the graphite.

The axle coupler provides a means of transmitting an electrical current signal from a rotating member to a nonrotating member. The current signal from the pressure transducer is transmitted across the hubcap and into the axle coupler. It enters the rotating conductor and travels through the rotating inner race, the graphite sleeve, and the nonrotating outer race. It then travels from the rotating conductor assembly to the system computer for signal processing. From there, the signal travels to the power supply and then back to the bearing on the opposite side of the axle coupler. It continues through the nonrotating outer race, the graphite sleeve, and the rotating inner race. Finally, it completes the circuit by traveling

back to the pressure transducer. A cross-sectional view of the in-axle installation is shown in Figure 5.

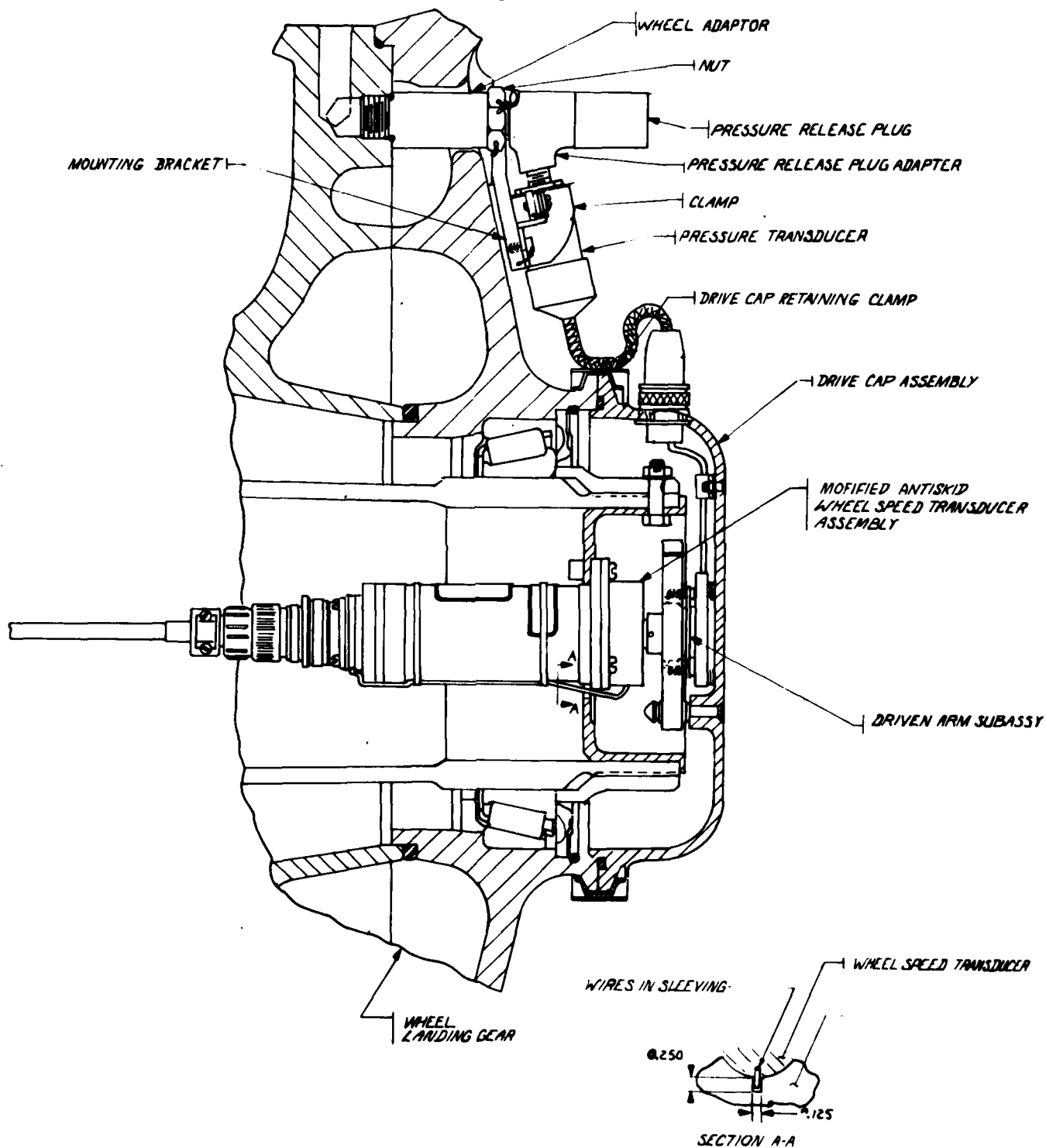


FIGURE 5. GOODYEAR TPI MAIN WHEEL INSTALLATION

4. System computer - Installed in the center accessory compartment (CAC), the computer is a microprocessor-based controller operating in a monitor mode. It has no controls to correct temperature or pressure but merely monitors and reports their status. Extensive built-in-test equipment (BITE) is incorporated to provide continuous self-test, monitoring capability, and fault isolation. The sensor response to the system computer is evaluated and is then reported to the cockpit display panel to provide the operating status. During system self-testing, the system computer will locate and identify any faulty wheel. Failure indications are transmitted to the cockpit display panel.

The front panel of the system computer features lockout switches (for pressure transducer only) which can be used to cut off the disabled wheel information, such as removal of a pressure transducer, so that no false input can activate the BITE light on the cockpit display panel. This is to avoid possible confusion with an actual component failure.

The system computer, as the central unit of the system, sends, receives, calculates, tests, and processes information to and from all other units. When an abnormal condition exists, the system computer outputs a warning to the cockpit display panel. In addition, data are sent to the cockpit display panel upon request of the flight crew.

5. Cockpit display panel - Installed in the flight engineer's station, this unit, shown in Figure 6, provides actual readouts of both brake temperatures and tire pressures. System computer data are displayed, including warnings on underinflated tires and overheated brakes. The mode selector (TEMP/PRESS switch) can put the system into either the temperature or the pressure mode. When the system is in the temperature mode, the TEMP light in the mode selector switch illuminates. The highest brake temperature is then displayed continuously. When an overheated brake condition exists-that is, when

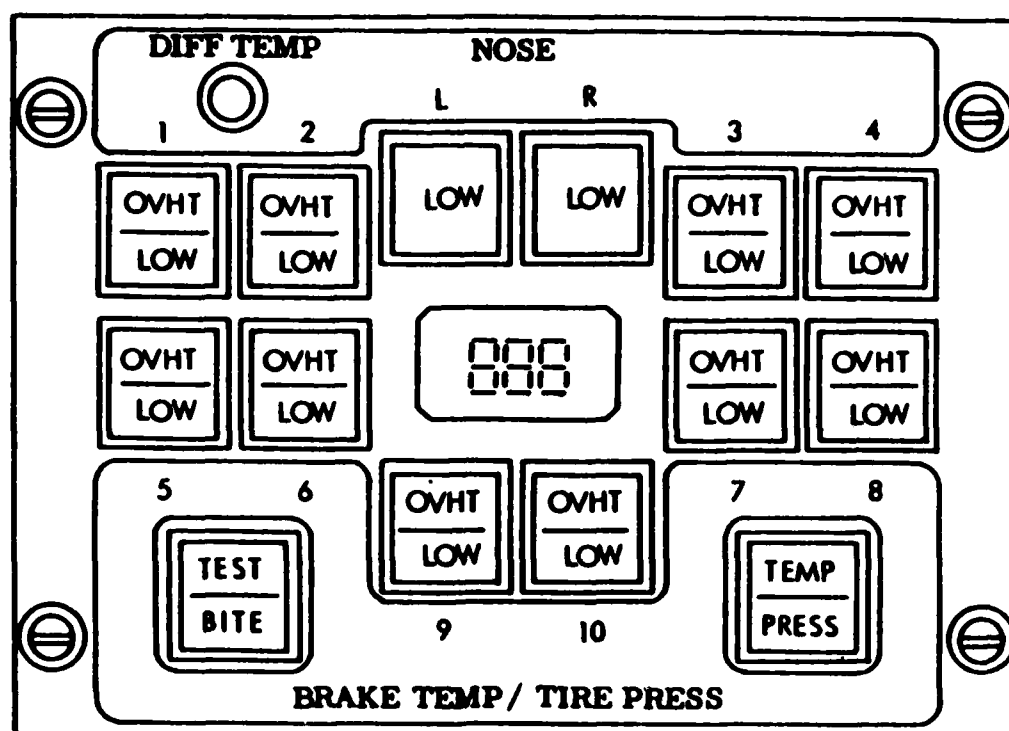


FIGURE 6. GOODYEAR BTM/TPI COCKPIT DISPLAY PANEL

any brake exceeds 400 degree centigrade, the OVHT light for that specific wheel will illuminate. Depressing the mode selector switch will change the temperature to the pressure mode. The PRESS light in the mode selector switch illuminates. In the normal condition, a blank readout is displayed. When a low tire condition exists, the LOW light for that specific wheel will illuminate. An automatic display corresponding to that low tire will appear in the digital readout. The low tire display is presented when any tire pressure falls below a preset low tire threshold, 140 psi for the main gear, and 120 psi for the centerline gear. These thresholds were established on the basis of in-service pressure minimums which assure safe, acceptable tire performance. In addition, a differential pressure allowance of 30 psi is programmed into the computer. This differential pressure is based on a value demonstrated in-service to preclude adverse tire overload performance. The low tire pressure warning will be activated if the pressure difference exceeds 30 psi between axle-mate tires. The cockpit display panel enables the low tire pressure threshold to be

set at any time. However, it is inconvenient to make such a change because one has to gain access to the internal part of the box.

The cockpit display panel identifies any fault component by illuminating the TEST/BITE light. However, each wheel switch must be depressed in order to determine the failure location. If the digital display reads 490 or higher, this will indicate a broken open sensor for the respective wheel position. If the digital display reads 000, this will indicate a shorted sensor for the respective wheel position. This fault isolation mode applies to both temperature and pressure modes.

The DIFF TEMP indicator light will illuminate to provide warnings on dragging (too hot) and inoperable (too cold) brakes. An allowable temperature deviation of approximately 65° C is preset. Any brake exceeding this threshold when compared to its average temperature will activate the warning light.

FAIRCHILD SYSTEM COMPONENT DESCRIPTION

The Fairchild BTM/TPI system is an analog system with a microprocessor to control, process, and display the data. A pressure transducer mounted in the wheel is powered by electronic circuits packaged in the wheel hub which are energized by a high-frequency alternate current signal from the transformer coupler mounted in the hub. A signal, transmitted at a frequency proportional to tire pressure, is sent back across the transformer to the onboard computer. The system shows good potential for eliminating false warnings. It has complete self-test capability. The system components are described in the following text.

1. Wheel component kit - Consists of a pressure transducer attached to the wheel by means of a banjo bolt fitting, a pressure tee fitting which is bolted into a threaded valve relief port in the wheel. It is installed to mount both the overpressure plug and the pressure

transducer. Because of the nose wheel steering and control, the nose wheel installation adds a counterbalance which is necessary to compensate for the additional weight from the wheel-mounted hardware.

The pressure transducer, shown in Figure 7, is a bonded strain gauge

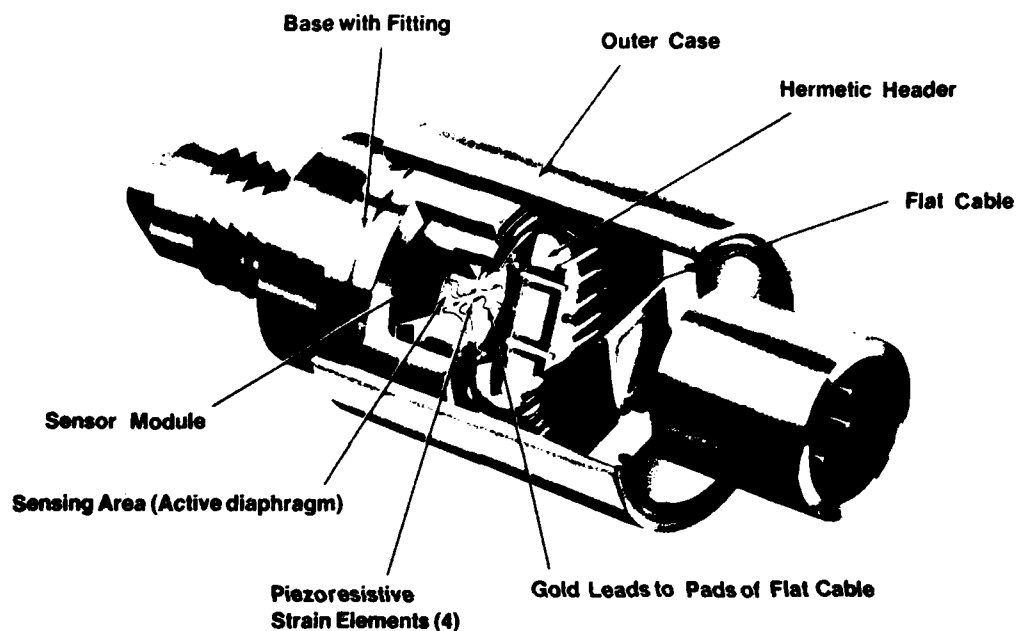


FIGURE 7. FAIRCHILD PRESSURE TRANSDUCER

device with the pressure medium isolated from the piezoresistive strain gauge elements. Therefore, moist air or even corrosive mediums will be fully compatible with the transducer: it is a hermetically sealed device in a stainless steel case, making it immune to hydraulic fluids and cleaning solvents as well as humidity, sand and dust, and other wheel environments. With a sealed unit, an error in gauge pressure occurs only at high altitude. The pressure transducer exceeds both the proof pressure of 460 psig and the burst pressure of 690 psig.

Double protection is afforded the user of the transducer against pressure leakage. First, the pressure element itself and then the

hermetic sealed header or case can withstand pressures well above the specified burst pressure of the element. Since the volumes inside the transducer are so small, a fractured sensing element will cause virtually no loss of tire pressure, although the transducer will fail. Pressure applied to one side of the diaphragm strains silicon semiconductor elements which are molecularly bonded to the reverse side and wired to form a wheatstone bridge circuit. Due to the piezoresistive effect of the silicon, strain in the gauges produces a change in their resistance which, in turn, produces an output linear with pressure when bridge excitation occurs. A plot of inflation pressure versus transducer output is shown in Figure 8.

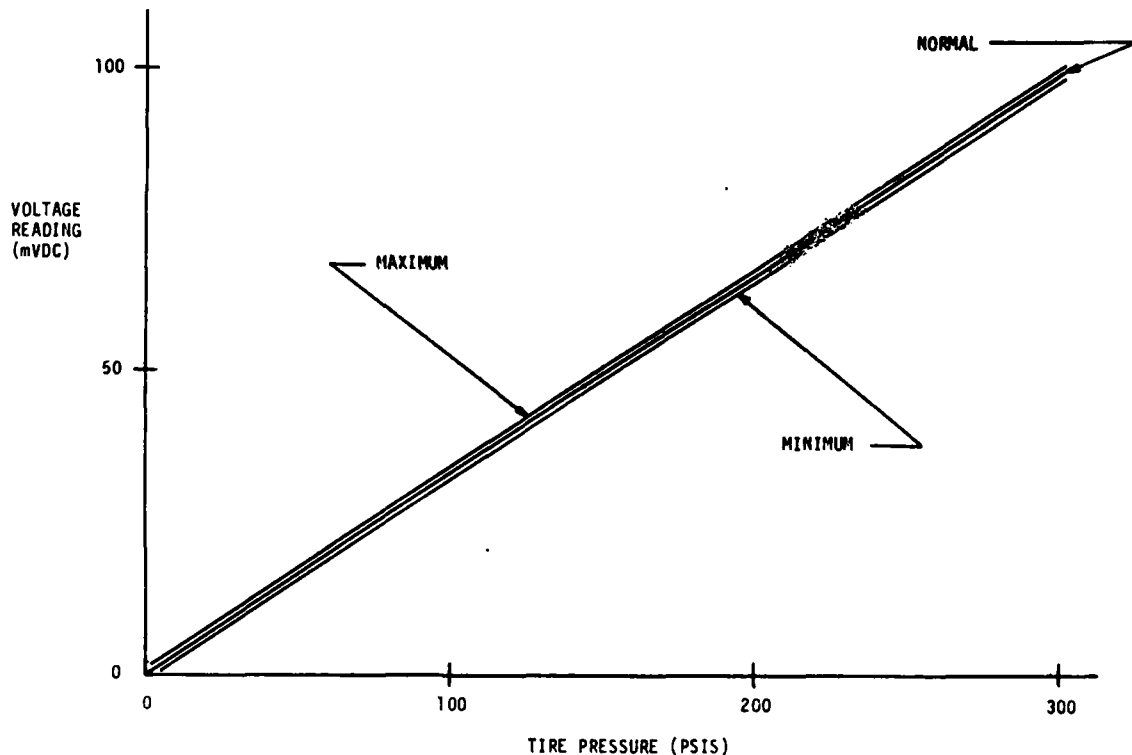


FIGURE 8. TIRE PRESSURE VERSUS PRESSURE TRANSDUCER OUTPUT (FAIRCHILD)

The pressure transducer is mated with a braided protective tubing assembly. The signal is transmitted through the cable assembly which is fixed to the modified DC-10 hubcap.

2. Wheel electronics and hubcap - A regular DC-10 hubcap is being reworked to add the necessary interface components. By means of a braided protective tubing, the pressure transducer signal is being transmitted through the wires within the cable assembly. A connection is made at the hubcap interface where the signal is brought into the wheel electronics. The wheel electronics, which are inside the hubcap, are protected from severe environments. They are potted with Dow Corning's Sylgard 182 to provide rugged encapsulation, and yet be resilient for excellent mechanical protection against shock, vibration, and humidity. As further protection, the entire potted assembly is sealed in a metal case and all components are located inside the hubcap. These wheel electronics are attached to a bellows coupling assembly which, in turn, is riveted into the hubcap. The bellows coupling assembly is arranged to compensate for any eccentricity during the mating of the inductive coupling.

3. Axle coupler/transformer - Provides tire pressure signal interface for transmission and conditioning. The axle coupler is formed by means of two inductive coils. The main wheel fixed coil (primary coil) is located inside the axle and is held in place by three screws. It is precisely located concentric to the antiskid wheel speed transducer shaft by a centering tool. The transducer has been modified so that it is driven by a spline shaft. The rework of the transducer involved the installation of a spline shaft adapter in place of the drive arm, as shown in Figure 9. The spline shaft was

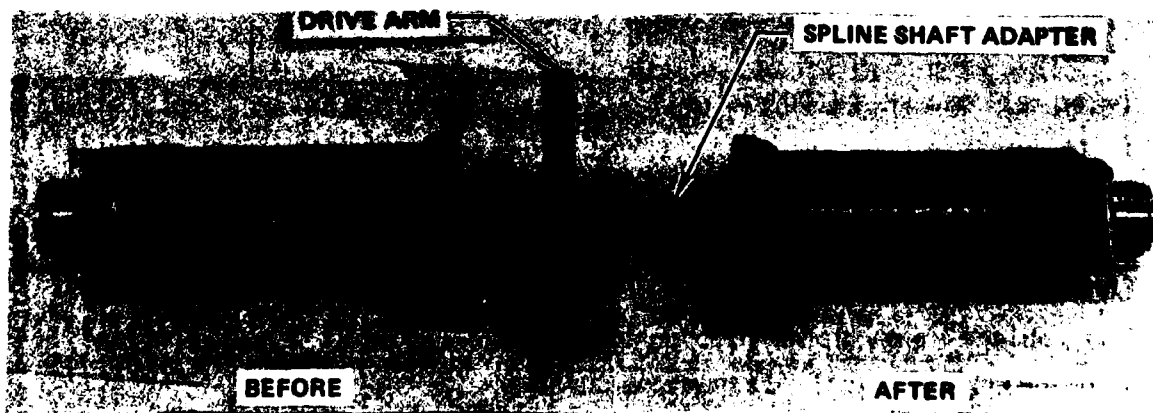


FIGURE 9. ANTISKID WHEEL SPEED TRANSDUCER REWORK

[illegible]

The nose wheel fixed coil is located inside the axle and is held in place by a jam nut or retaining nut. Since there is no antiskid wheel speed transducer in the nose wheel, the rotating coil will form the inductive coupling by maintaining a bigger air gap with the fixed

SIDE VIEW OF WHEEL ASSEMBLY
 - WHEEL HUB
 - WHEEL RIM
 - WHEEL BEARING
 - WHEEL NUT
 - WHEEL STUD
 - WHEEL LUG
 - WHEEL SHOCK
 - WHEEL SPRING

TOP VIEW OF WHEEL ASSEMBLY
 - WHEEL HUB
 - WHEEL RIM
 - WHEEL BEARING
 - WHEEL NUT
 - WHEEL STUD
 - WHEEL LUG
 - WHEEL SHOCK
 - WHEEL SPRING

4. System computer - Similar to the Goodyear system, the Fairchild system computer performs the primary functions. It consists of printed circuit boards, transformers, and internal wiring. The computer circuit board, which is the central processing unit, controls the system functions and processes information. The power supply printed circuit board converts 400 Hz input power to +5 vdc and +12 vdc to power the various logic components. It also generates +30 vdc for the oscillator board which converts direct current to 52 kHz alternate current for powering the wheel electronics at the hubcap. This 52 kHz signal is being multiplexed by the wheel select printed circuit board. To detect the pressure frequency return signal from the wheel electronics, a current detector circuit is provided. The system computer interfaces with the cockpit display panel at all times.

The low tire pressure threshold adjustment is available in the system computer. However, it is inconvenient to readjust the threshold settings inside the computer.

5. Cockpit display panel - The Fairchild panel is shown in Figure 12. Its function is identical to the Goodyear cockpit display

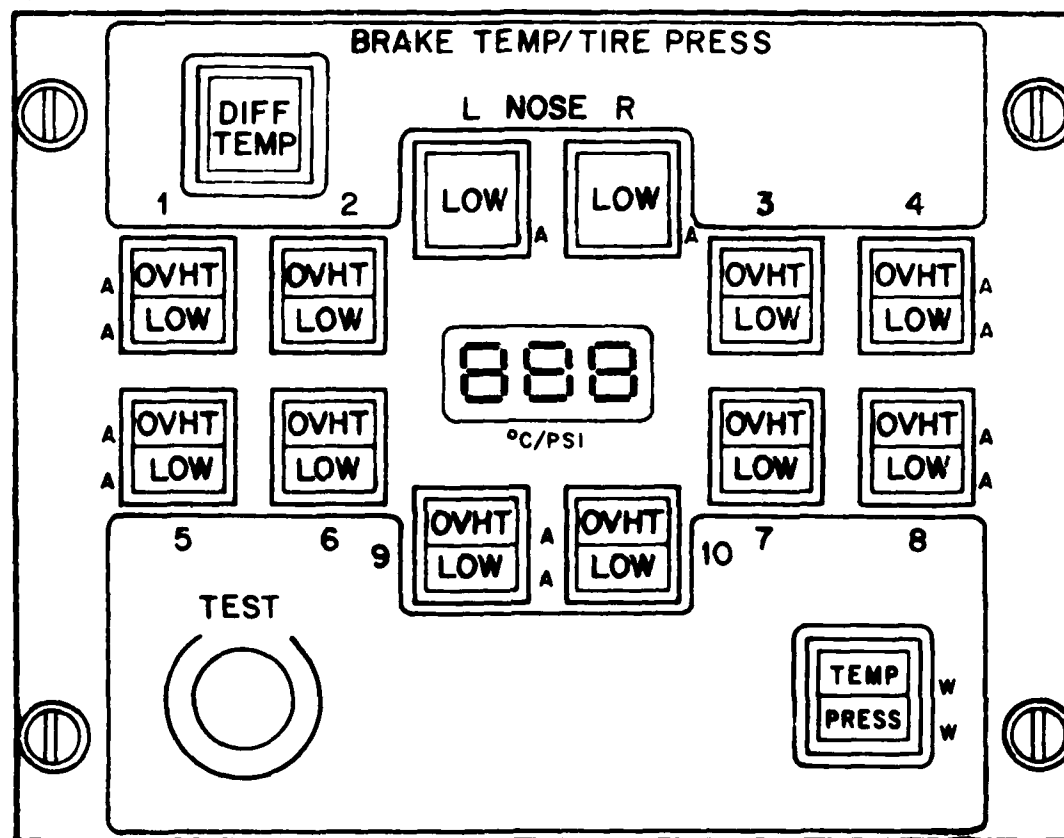


FIGURE 12. FAIRCHILD BTM/TPI COCKPIT DISPLAY PANEL

panel. When the TEST switch is depressed, all wheel lights will illuminate and the figure 888 will be displayed on the digital indicator. This verifies the lighting integrity.

Depressing the mode-select switch will put the system in either the temperature or pressure mode. In the temperature mode, the TEMP light illuminates. The temperature of the hottest brake is displayed continuously on the digital indicator. When the switch for a specific

wheel is depressed, the digital indicator will display that wheel's brake temperature value. If the temperature of a specific brake exceeds 400° C, the respective light will illuminate OVHT. If the temperature of any brake exceeds an allowable deviation, approximately 65° C above or below the average of all brakes, the differential temperature light will illuminate.

When the mode-select switch is depressed, the PRESS light will illuminate, indicating the system is in the tire pressure mode. Depressing the switch for a specific wheel causes the digital indicator to display that tire's pressure value. If the pressure of a specific tire is below the preselected value, the corresponding light will illuminate LOW, with the tire pressure value displayed on the digital indicator. The low tire pressure threshold is 151 psi for the nose gear, 139 psi for the main gear, and 123 psi for the centerline gear. In addition, unlike the Goodyear system, a pressure difference that exceeds 15 percent between axle-mate tires will trigger the low tire pressure warning. The lower of the two readings will be displayed and the corresponding LOW light will illuminate.

Fault isolation is available in the cockpit display panel. Depressing the test switch will provide a lighting check. Upon release of the switch, if all components are fault-free, the lights will go out and the word GO will be displayed on the digital indicator. If a faulty component exists, a fault code will be displayed upon the release of the test switch. For a failed brake temperature sensor in the No. 1 wheel, "b1" will be displayed. For a failed tire pressure transducer in the No. 1 wheel, "F1" will be displayed. Multiple failures are indicated sequentially in the same manner. Depressing the test switch once more will remove the display of the fault information. However, the flight crew will not be aware of any faulty component unless the test switch is depressed.

IN-SERVICE EVALUATION

SYSTEM INSTALLATION

The Goodyear BTM/TPI system was installed in March 1980. The initial system installation for monitoring tire pressure did not include the nose gear because the nose wheel hardware was not available. Instead, a resistor was placed across the pins at the computer so that nose wheel tire pressure could be simulated without the possibility of a nuisance warning being given. As an alternative, the lockout switches on the front of the computer could be used to ensure the BITE light is off due to any disabled wheel. During the pressure transducer installation, most of the transducers provided readings within tolerance. The out-of-tolerance transducers were replaced and better readouts were attained. Goodyear had classified the pressure transducers into primary and secondary pressure transducers. The primary pressure transducers provided good, accurate readings within the tolerance. The cockpit display panel provided tire pressure readout within 5 psi of the actual value obtained from the hand-held tire pressure gauge. However, the secondary pressure transducers did not achieve such accuracy. With a range of ± 9 psi of the actual pressure, the readout was considered unacceptable. Goodyear decided to have the pressure transducer manufacturer recalibrate the out-of-tolerance transducers, and after the installation the following readings were taken, as shown in Table 1.

During the installation, Goodyear employed modified antiskid wheel speed transducers to act as an interface for electrical signal transmittal. Because of the contact between rotating and nonrotating members, service reliability becomes an important factor in the life of the modified antiskid wheel speed transducer. In addition, wear resulting from friction may create problems.

The Goodyear special hubcap must be carefully oriented when it is

TABLE 1. GOODYEAR PRESSURE READOUT AFTER SYSTEM INSTALLATION

WHEEL NUMBER	PRESSURE DISPLAYED (PSI)	ACTUAL PRESSURE ** (PSI)	FILL VALVE GAUGE (PSI)	BRAKE TEMPERATURE READOUTS (°C)
1	170	169.2	164	012
2	174	174.1	173	012
3	174	171.7	172	008
4	176	170.0	173	012
5	178	179.9	178	012
6	180	177.0	180	012
7	176	176.5	173	012
8	174	169.3	168	008
9	153	150.7	153	008
10	153	150.7	153	008
11 (NL)	158	160.0	160	---*
12 (NR)	160	160.0	160	---*

* No brake was installed in the nose wheel.

** Actual pressure was taken with a hand — held tire pressure guage with ± 2 psi accuracy.

mounted in order to ensure that the two-pin connector plug is mated properly. The orientation will determine the electrical interface efficiency. In addition, the hubcap connector needs to be oriented correctly before the braided tubing can be mated onto the hubcap. On one occasion, a BITE warning appeared on the cockpit display panel. An isolation check disclosed that the hubcap created a problem. Apparently, the hubcap connector prong was shorted, resulting in a faulty component indication. This was probably due to misorientation of the hubcap during the installation.

After the Goodyear system was installed on the aircraft, a functional test was conducted to verify the system integrity. The following

minor problems were found:

1. One of the warning switches was loose. This caused the light to fail to illuminate for an underinflated tire or overheated brake. The flight crew would not be aware of the problem.
2. After power switching, the system was locked up in one mode. This did not allow for mode selection. The memory lock-up condition was cured by cycling the circuit breaker.
3. There were a few instances in which the brake overheat lights illuminated. Indication was normal after the suspected brakes were checked. By recycling the circuit breaker, the problem disappeared and the system was in normal operation again.

The Fairchild BTM/TPI system installation was completed with no major discrepancies. This was a complete installation with the nose wheel tire pressure monitoring included. Although the nose tires had not been a significant problem, Swissair intended to use the TPI system as part of its tire maintenance program which must, of course, include the nose tires. Several special tools were utilized. By means of a locating tool, the fixed coil (primary coil) could be installed concentric to the antiskid wheel speed transducer shaft, as shown in Figure 13.

In order to connect the pressure transducer assembly to the hubcap, a connector orienting tool was employed to orient the connector keys. The installation was difficult to accomplish because of limited spacing between the connector and the wheel hub and because the technique was very cumbersome. Figure 14 shows the arrangement of the installation.

The antiskid transducer is driven by a splined shaft and bellows coupling attached to the DC-10 hubcap. The air gap at the fixed

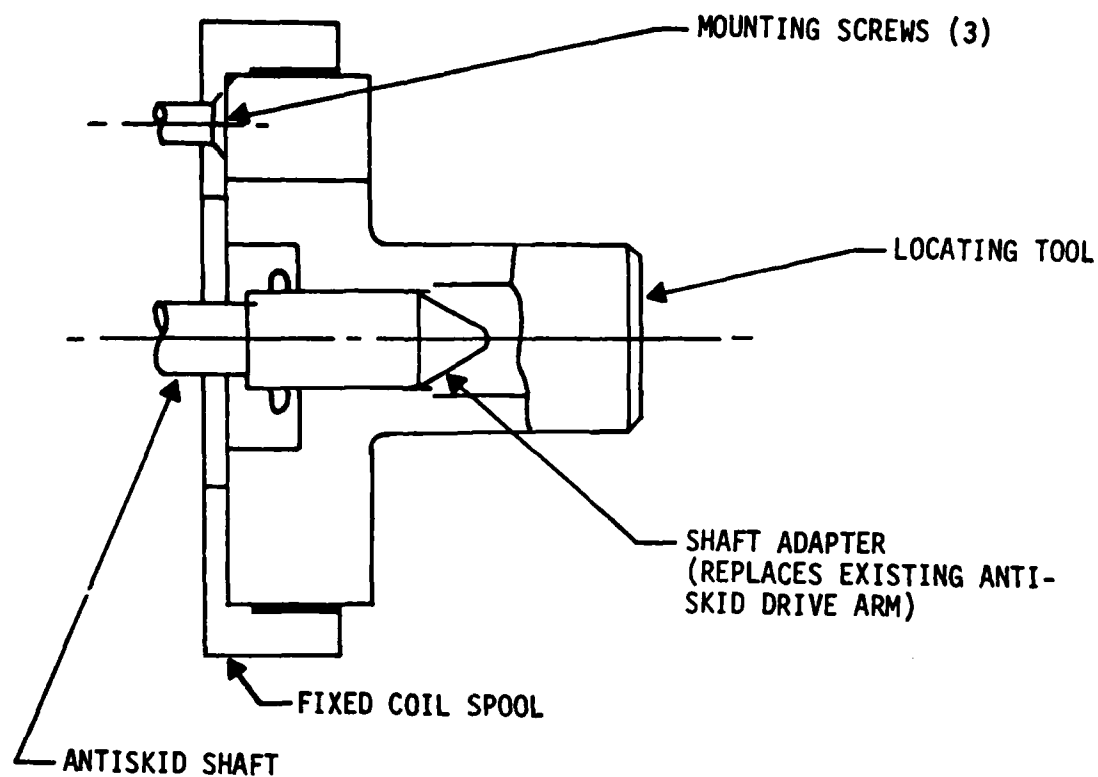


FIGURE 13. INSTALLATION OF FAIRCHILD PRIMARY COIL

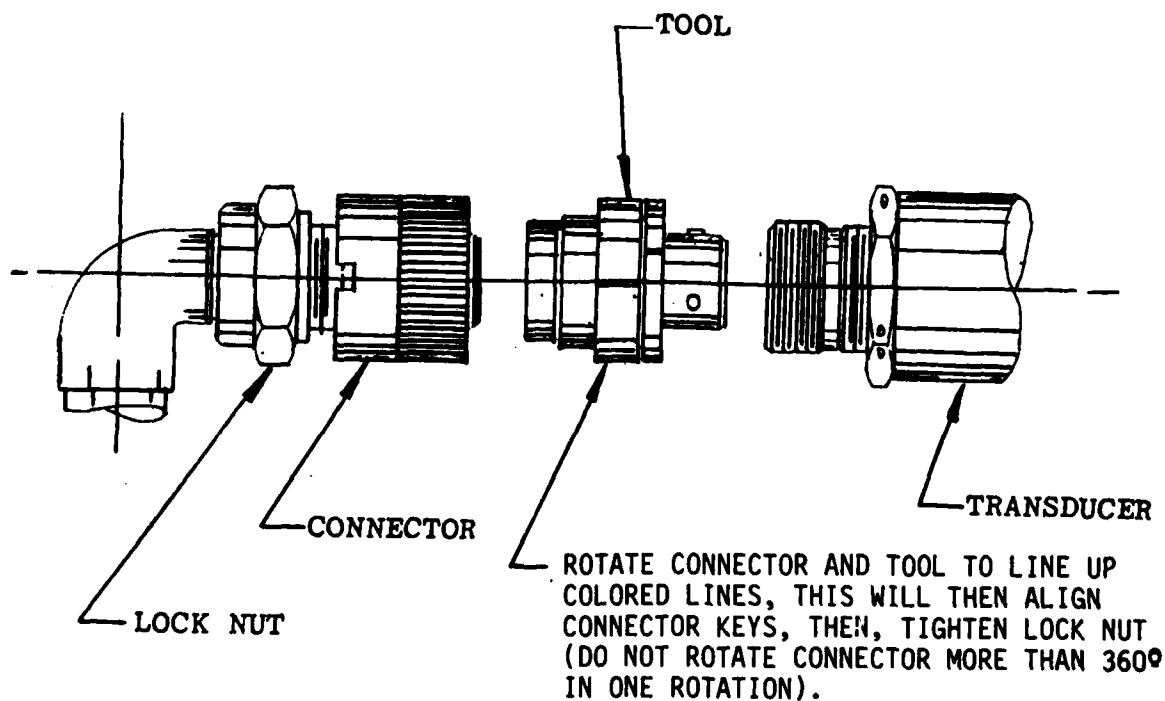


FIGURE 14. INSTALLATION OF FAIRCHILD PRESSURE TRANSDUCER

coil-rotating coil interface is 0.010 inch radially. The effect of misalignment during wheel installation may present a problem in this new constant-speed technique. Also, the nominal air gap was a cause of extreme concern because of possible interference.

After the Fairchild system was installed, a functional check revealed several problems. First, the wheel No. 1 switch was stuck after it was depressed. This caused the system to behave as if the wheel No. 1 switch were closed at all times. As a result, the data could not be interrogated on other wheels. Second, the temperature and pressure mode selection switch was locked up on several occasions, so that a mode could not be selected for display. The above faulty conditions were analyzed and it was found that a stuck (closed) switch caused a program hang-up which, in turn, caused the mode selector to lock up. The third problem was discovered during the flight. No brake temperature indications were available. After a few hours in cruise flight, the system was reactivated by cycling the circuit breaker after the system cooled down. Upon failure analysis, a bad capacitor was found. It inhibited the brake temperature function at high temperatures. These problems were solved at the beginning of the in-service test.

The initial checkout provided a tire pressure readout of ± 1 psi. It appeared that the system achieved very high accuracy. On completion of the installation, readings were taken to verify the system accuracy. As indicated in the Table 2, the data point is very accurate.

INITIAL FLIGHT TEST RESULTS

After the Goodyear system installation and preflight checkout, a test flight was conducted to verify the system integrity and performance. The aircraft taxied for a short distance, took off, and cruised at

TABLE 2. FAIRCHILD PRESSURE READOUT AFTER SYSTEM INSTALLATION

WHEEL NUMBER	PRESSURE DISPLAYED (PSI)	ACTUAL PRESSURE ** (PSI)	FILL VALVE GAUGE (PSI)	BRAKE TEMPERATURE READOUTS (°C)
1	175	176	180	20
2	174	174	172	20
3	174	175	170	24
4	174	174	174	20
5	174	175	172	20
6	174	174	172	20
7	175	175	171	20
8	175	174	178	20
9	152	153	145	20
10	150	152	153	20
11 (NL)	183	184	---	--*
12 (NR)	185	186	---	--*

* No brake was installed in the nose wheel.

** Actual pressure was taken with a hand — held tire pressure guage with ± 0.5 percent full-scale accuracy.

high altitude with full braking during final landing. The preflight reading is shown in Table 3.

There were steady tire pressure readouts throughout the taxi maneuver. No discrepancy was detected. After a manual brake landing, the monitored tire pressure was compared to the tire pressure readouts from the fill valve gauges, as shown in Table 4. The readings were satisfactory.

The Fairchild system provided consistent data during the test flight. Temperatures were indicated for different conditions as anticipated. During the full brake landings, the highest temperature was noted at 300° C. It gradually dropped to about 180° C after the aircraft was towed back to the hangar. Further readings of cockpit tire pressure

TABLE 3. GOODYEAR PREFLIGHT DATA

WHEEL NUMBER	PRESSURE DISPLAYED (PSI)	AFTER TAXI PRESSURE (PSI)
1	178	182
2	176	176
3	178	178
4	180	184
5	178	178
6	178	180
7	178	178
8	180	182
9	154	154
10	158	158
11 (NL)	---*	---*
12 (NR)	---*	---*

TABLE 4. GOODYEAR POSTFLIGHT DATA

WHEEL NUMBER	PRESSURE DISPLAYED (PSI)	FILL VALVE GAUGE (PSI)	BRAKE TEMPERATURE READOUTS (°C)
1	180	175	08
2	176	180	54
3	182	184	88
4	182	188	88
5	178	180	62
6	182	179	60
7	178	190	40
8	180	178	86
9	156	150	54
10	160	158	60
11 (NL)	---*	---	--**
12 (NR)	---*	---	--**

* Resistor was taken off, thus no readout was available.

** No brake was installed in the nose wheel.

data were taken and compared to the actual tire pressure readouts from the hand-held pressure gauge. The wheels were very warm due to the heat sink generated during the hard braking. The outside surface of the hubcap was approximately 70° to 80° C. The data recorded are given in Table 5. In addition, pressure readouts were plotted versus time during the test flight, as shown in Figure 15.

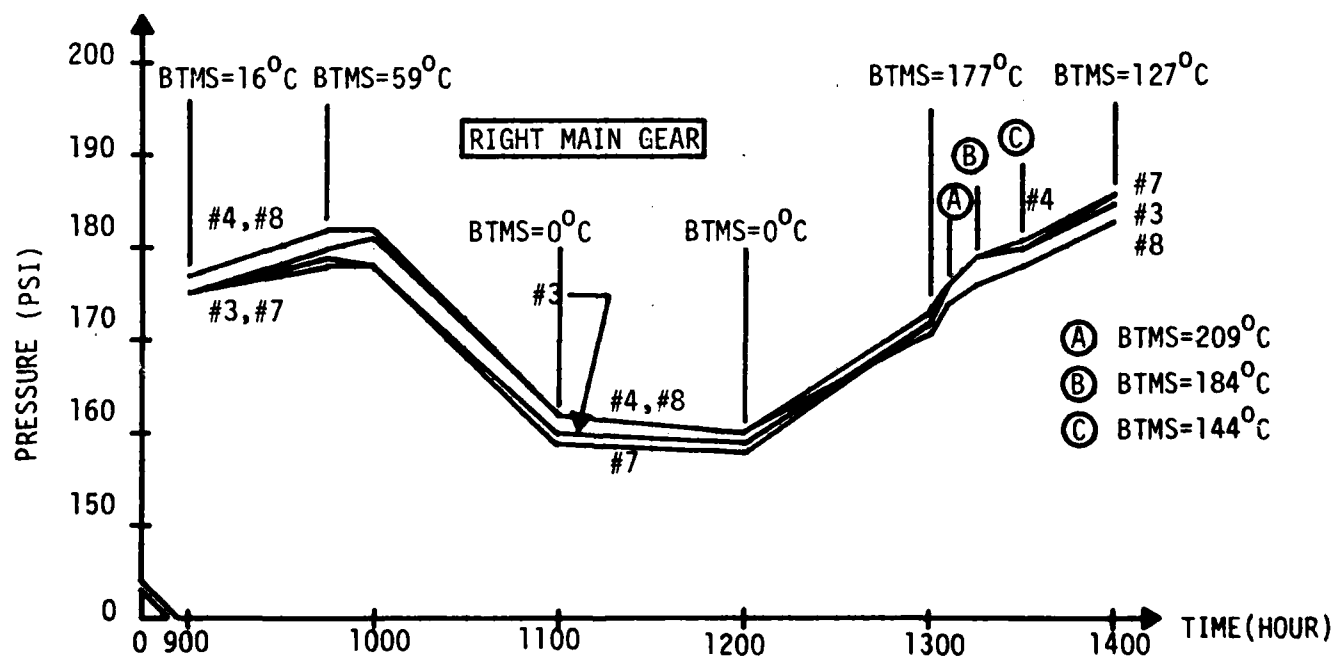
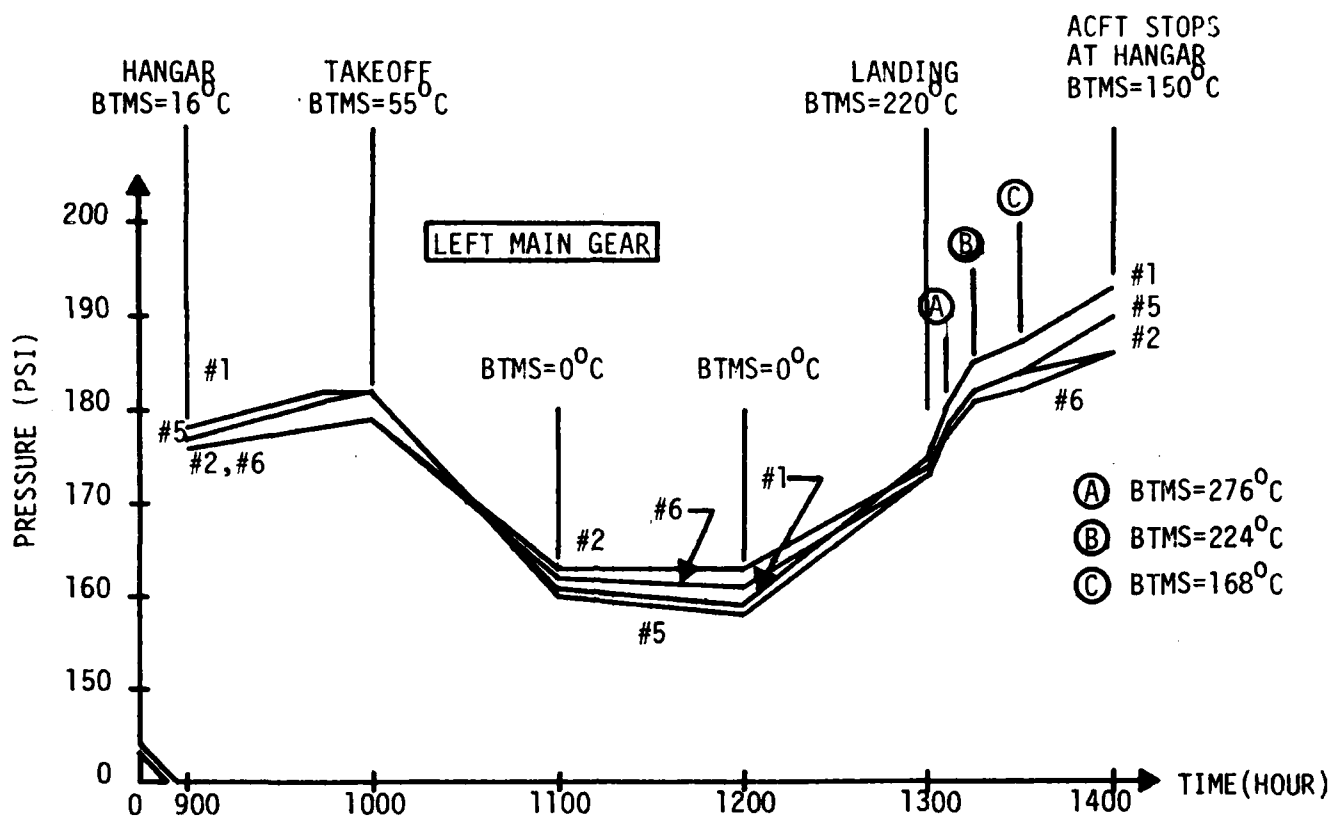
TABLE 5. FAIRCHILD POSTFLIGHT DATA

WHEEL NUMBER	PRESSURE DISPLAYED (PSI)	ACTUAL PRESSURE ** (PSI)	FILL VALVE GAUGE (PSI)	BRAKE TEMPERATURE READOUTS (°C)
1	196	190.5	192	164
2	187	187.0	188	148
3	187	185.5	181	152
4	185	185.0	188	104
5	191	189.0	188	156
6	186	186.5	190	132
7	188	184.0	182	140
8	183	183.5	190	112
9	162	161.5	152	116
10	167	163.0	163	120
11 (NL)	184	185.5	---	---*
12 (NR)	186	188.0	---	---*

* No brake was installed in the nose wheel.

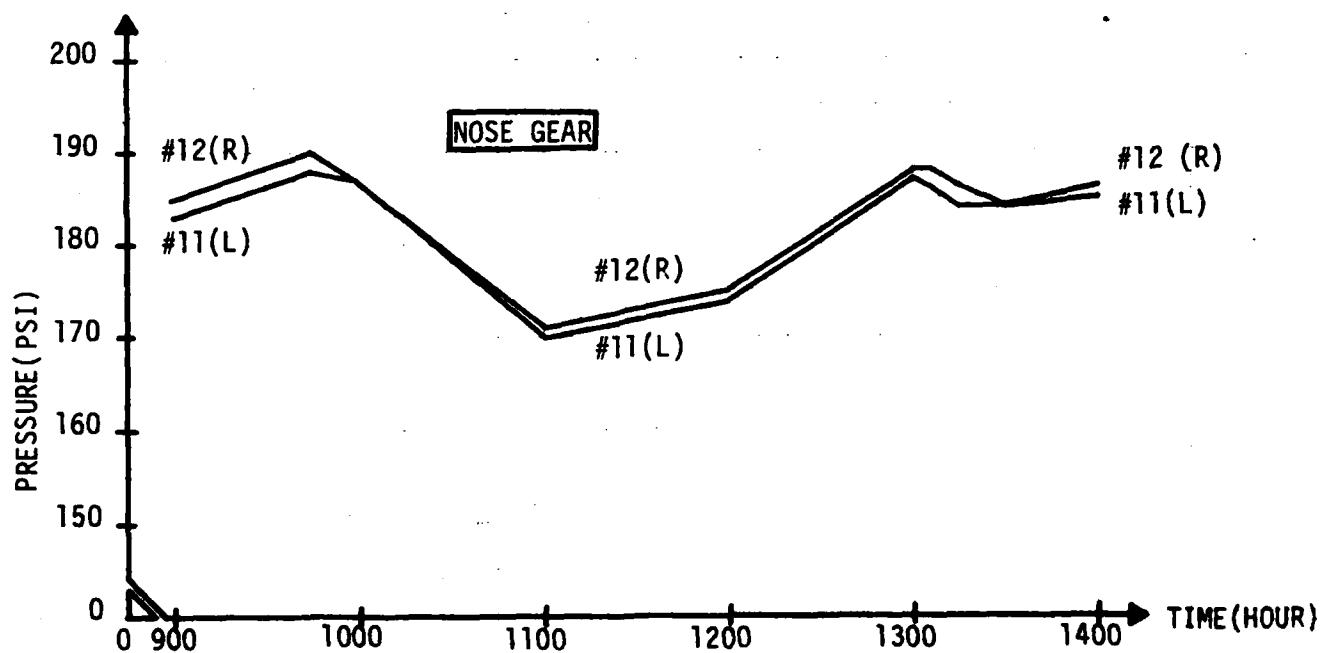
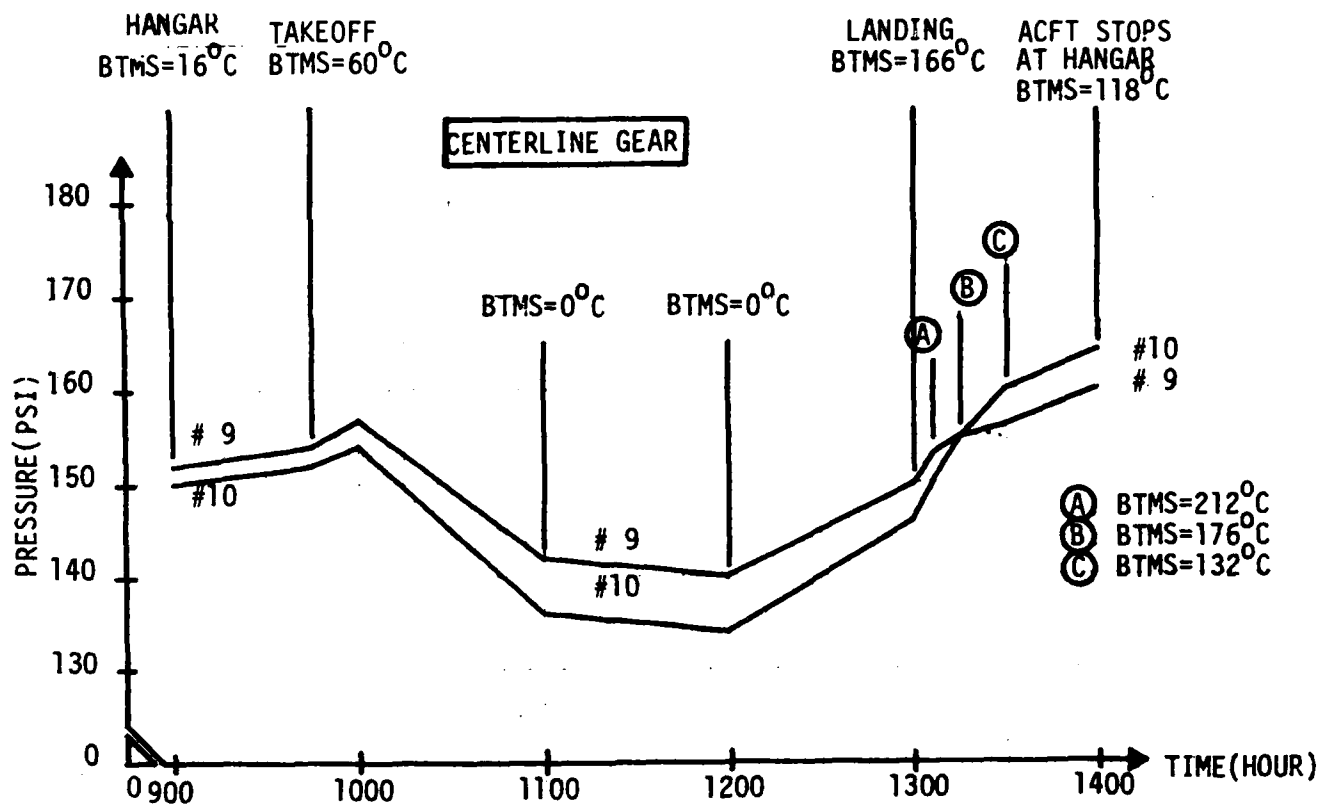
** Actual pressure was taken with a hand — held tire pressure guage with ± 0.5 percent full-scale accuracy. The outside air temperature was 16°C.

Several brake temperature readouts provided blank displays at high altitude with the cold-soaked outside air temperature at -50° C. The system was designed in such a way that the blank display referred to a faulty wheel component. Fairchild had to modify the software intelligence in order to distinguish between the real faulty wheel and low temperature.



NOTE: BTMS READINGS ARE BASED ON THE AVERAGE FOR ALL WHEELS IN THE GEAR.

FIGURE 15. FAIRCHILD TEST FLIGHT DATA



NOTE: BTMS READINGS ARE BASED ON THE AVERAGE FOR ALL WHEELS IN THE GEAR.

FIGURE 15. FAIRCHILD TEST FLIGHT DATA (CONTINUED)

IN-SERVICE DATA

A year-long in-service test was scheduled. This would provide sufficient exposure to various actual environmental conditions in which the TPI system must operate. Swissair monitored the test throughout the evaluation period. Valuable data were obtained.

The Goodyear system was put into service flights on March 2, 1980. During a flight from Zurich to Boston, a couple of minor problems were found. The wheel No. 5 lamp did not illuminate when the TEST/BITE switch was depressed. Also, lights were intermittently on and off on wheels No. 7 and 8. It was later found that the wheel switches became loose. In addition, the digital display was controlled by the flight engineer's panel light and could not be read unless the light was turned up to its maximum. The undesired heat dissipation from other panel lights presented a problem during daytime flights.

After the aircraft landed at Boston, the circuit breaker had to be reset in order to bring the system into the temperature mode of operation. The brake temperature of wheel No. 8 read 0° C. A check with a hand-held temperature gauge showed no discrepancy. After the temperature stabilized, the readout was back to normal. Data of the first service flight are shown in Table 6.

The Goodyear system performed satisfactorily over the first segment of the in-service test evaluation. Later, there were several problems which indicate apparent deficiencies in the system. The initial batch of pressure transducers was out-of-tolerance and provided inaccurate tire pressure readings. In addition, a few minor problems required the system software and hardware to be modified. The system was removed from the aircraft, except for the wheel-mounted hardware, from May through August 1980. A modification was made to improve the system reliability and performance. After the reinstallation, the in-service evaluation lasted until February 1981.

TABLE 6. GOODYEAR'S FIRST SERVICE FLIGHT DATA

WHEEL NUMBER	PRESSURE DISPLAYED (PSI)	FILL VALVE GAUGE (PSI)	BRAKE TEMPERATURE READOUTS (°C)
1	180	172	12
2	182	182	14
3	180	179	46
4	176	174	46
5	176	175	18
6	184	181	14
7	178	188	58
8	178	178	00
9	154	154	20
10	154	155	28
11 (NL)	---*	---	--**
12 (NR)	---*	---	--**

* Resistor was taken off, thus no readout was available.

** No brake was installed in the nose wheel.

Because there was insufficient time for further system modification, Swissair decided to discontinue the testing. There were adequate data to indicate that the system concept was still in the preliminary stage. A total of 20 false low tire pressure warnings had been obtained, which was considered unacceptable. Several major discrepancies must be resolved:

1. Pressure Transducer Accuracy - This was one of the major causes of the false low tire pressure warnings. The tolerance band did not meet the desired accuracy of ± 3.5 psi. This basically increased the error in pressure transducer indication. In addition, tire pressure readings had a tendency to scatter if the tires got warm and pressures rose, and uneven wheel well cooling complicated the errors. This, coupled with inaccurate pressure transducer readouts, increased the

chances of a nuisance warning.

2. Pressure Transducer Failure - Several pressure transducers have had broken leads within the rubber pigtail arrangement. The rubber and shielding were broken on about half the circumference at the cable-rubber cap transition. The connector cable was torn at the point of entry into the transducer-cable potting junction. This was due to inadequate design of the rubber shielding boot which protected the cable wire. The rubber could vulcanize in the harsh environment of the wheel area. In addition, the rubber might be damaged from rough handling while changing wheels, tires, and hubcaps.

3. Pressure Transducer Mounting Clamp - It was cracked in the process of being tightened while a pressure transducer was being mounted. This occurred several times. During tightening, the steel pressure transducer clamp was pulled down directly, with no provision for stress relief.

4. Connection between Hubcap and Antiskid Wheel Speed Transducer - The electrical pins in the hubcap were susceptible to damage because they were too fragile for this application. The connector - i.e., the banana plugs and jacks - presented an indexing problem. It was extremely difficult to orient and slip the hubcap and banana plug assembly into place. A number of the plugs had been bent and had thereby caused erroneous indications.

5. Malfunction of the Rotary Conductors - Goodyear had embedded a copper-graphite-copper bearing interface inside the antiskid wheel speed transducer to transfer the electronic signal. Swissair discovered the units remained hot for four hours after the aircraft landed. Further investigation revealed low isolation resistance due to leakage. Analysis indicated that the breakdown of insulation was caused by rubbing of internal rotating parts. According to Goodyear's findings, these parts were apparently out of tolerance. During

assembly, the excessive part dimension tolerances introduced a preload in the internal parts as verified by the stiffness of the rotating conductor (modified antiskid wheel speed transducer). The excessive bearing preload on the rotary conductor caused a heat build-up and excessive wear on the graphite sleeves, which resulted in high contact pressure.

One of the failed units had considerable wear on the edge of the graphite ring. Some of the resulting carbon dust electrically paralleled the pressure transducer variable resistance, thus lowering the apparent transducer resistance and appearing as an erroneous low tire pressure reading. Additionally, a direct short to ground caused by insulation wear was noted on the rotary conductor assembly. The electrical insulation wore through because of mechanical interference.

There were some miscellaneous problems such as the need for shimming under the pressure transducer clamp because of the varying distance between the pressure transducer axis and mounting bracket; reducing the number of lockwires in order to save man-hours in installing the pressure transducer; adding a Teflon band onto the pressure transducer pipe thread so it would be airtight; and undesirable system weight. However, the failures of the pressure transducers and the rotary conductors played a major role in producing false low tire pressure warning indications.

The Goodyear system was in service for more than 1,000 landings and 4,000 flight hours. Data are presented in Appendix A. In spite of the problems with system performance, it still detected four justified low tire pressure warnings. However, it is believed that a higher number of low tire pressure warning indications could result from the large tolerance bands of the pressure transducers which triggered the differential low tire threshold.

The Fairchild system was put into flight service on March 29, 1980.

The performance was excellent. System accuracy was well within the specified requirement of ± 3.5 psi. By means of a test gauge with an accuracy of ± 0.5 percent, tire pressure information could be verified. In fact, the tire pressure readouts were far more accurate than the hand-held tire pressure gauges during maintenance checkouts. A few early problems were detected which were responsible for 15 false low tire pressure warnings.

1. A pressure transducer failed because a lead wire broke off the printed circuit board inside the pressure transducer. Further investigation revealed a lack of stress relief on the lead wire, allowing it to separate from the solder terminal when subjected to vibration. Subsequently, when the lead wire separated from the terminal post, no current could flow in the circuit. A design correction which employs a special epoxy filler will ensure that the wire is connected to the printed circuit board.

2. Because the pressure transducer must be oriented in order to mate with the braided tubing assembly, a special tool is needed and additional time must be allowed to make the installation possible. During wheel replacement, the pressure transducer cable must be oriented carefully for correct connector key indexing. For future production, the hubcap disconnect will be at the hubcap interface.

3. An air leak occurred once, on the banjo bolt assembly. It was found that air leakage occurred at the O-ring between the wheel and the banjo bolt assembly, which consisted of the banjo bolt and sleeve. It was suspected that an unconventional type of sealing three parts with one O-ring was the cause of leakage. A redundant O-ring was added between the banjo bolt and sleeve to solve this problem.

Most of the above problems were corrected. With the system in use for over 1,500 landings and 5,000 flight hours, the performance has been superior. A total of eight justified low tire pressure warnings was

obtained and verified. All data are presented in Appendix B.

Typical tire pressure behavior during all phases of flight is shown in Figure 16. These data described the tire pressure phenomenon which was unknown before. They also verified the effect of uneven cooling inside the wheel well. It should be noted that the tire pressures of wheels No. 2 and 6 were considerably higher than their mating wheels.

A special hard braking test was performed to verify the Fairchild system integrity. Tire pressures were rising because of the additional brake heat created by the application of the brake during taxi-in. Figure 17 presents the deviation of the cockpit display reading from the hand-held gauge reading. Brake temperature versus time is shown in Figure 18. It is apparent that the time required for temperature stabilization is at least 3 hours.

SUMMARY

The in-service test was officially completed by the end of May 1981. Both Goodyear and Fairchild systems provided satisfactory results. The Goodyear system, despite several major problems, is still considered promising. However, further development, redesign, and testing are needed in order to perfect the system. The Fairchild system proved to be an excellent system with demonstrated accuracy and reliability. The accurate tire pressure readout gave the maintenance and flight crews confidence in the system. The testing experience provided a better insight into perfecting the TPI system for production usage. As a result, it was decided to proceed with a production version of a TPI system.

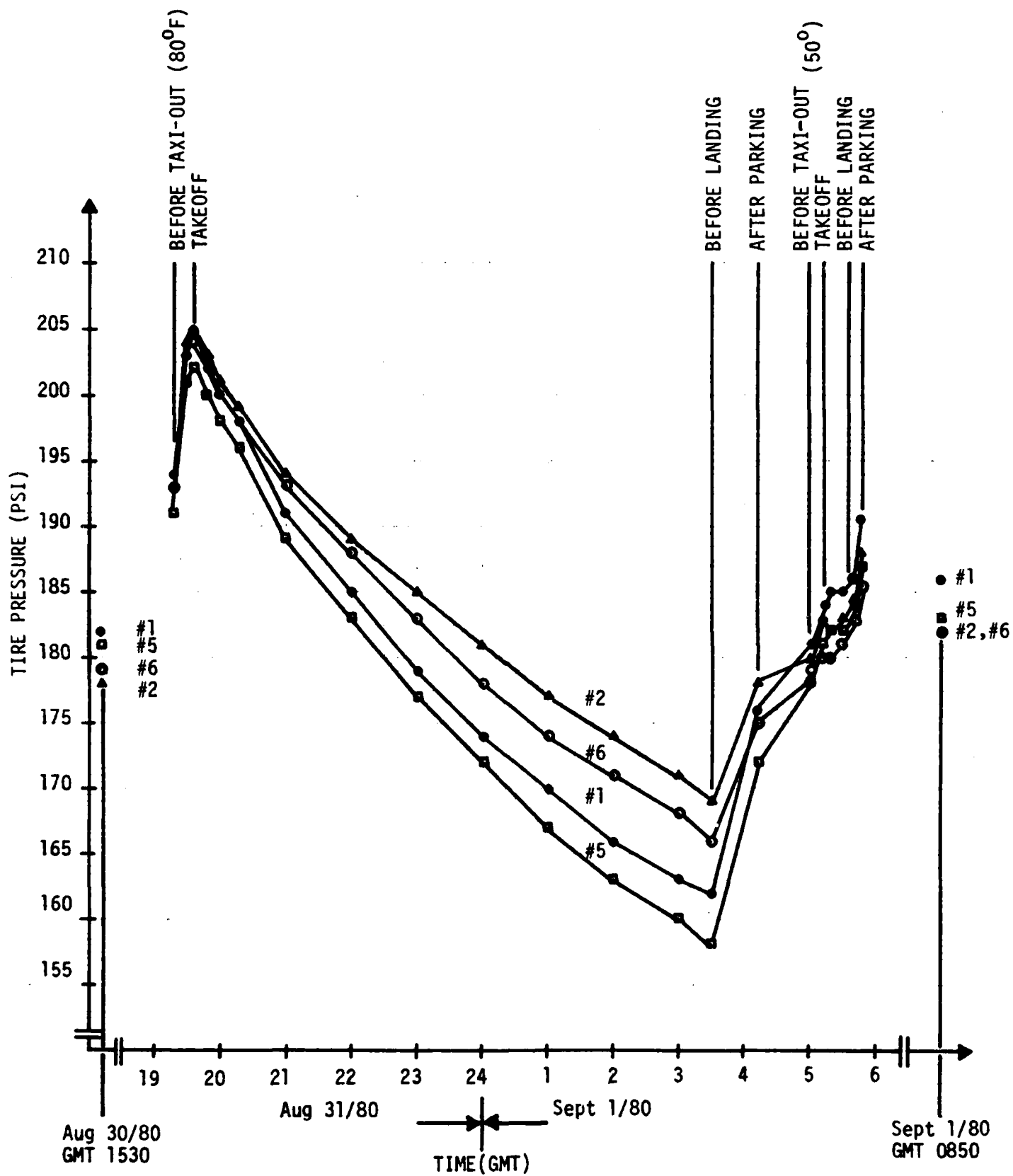
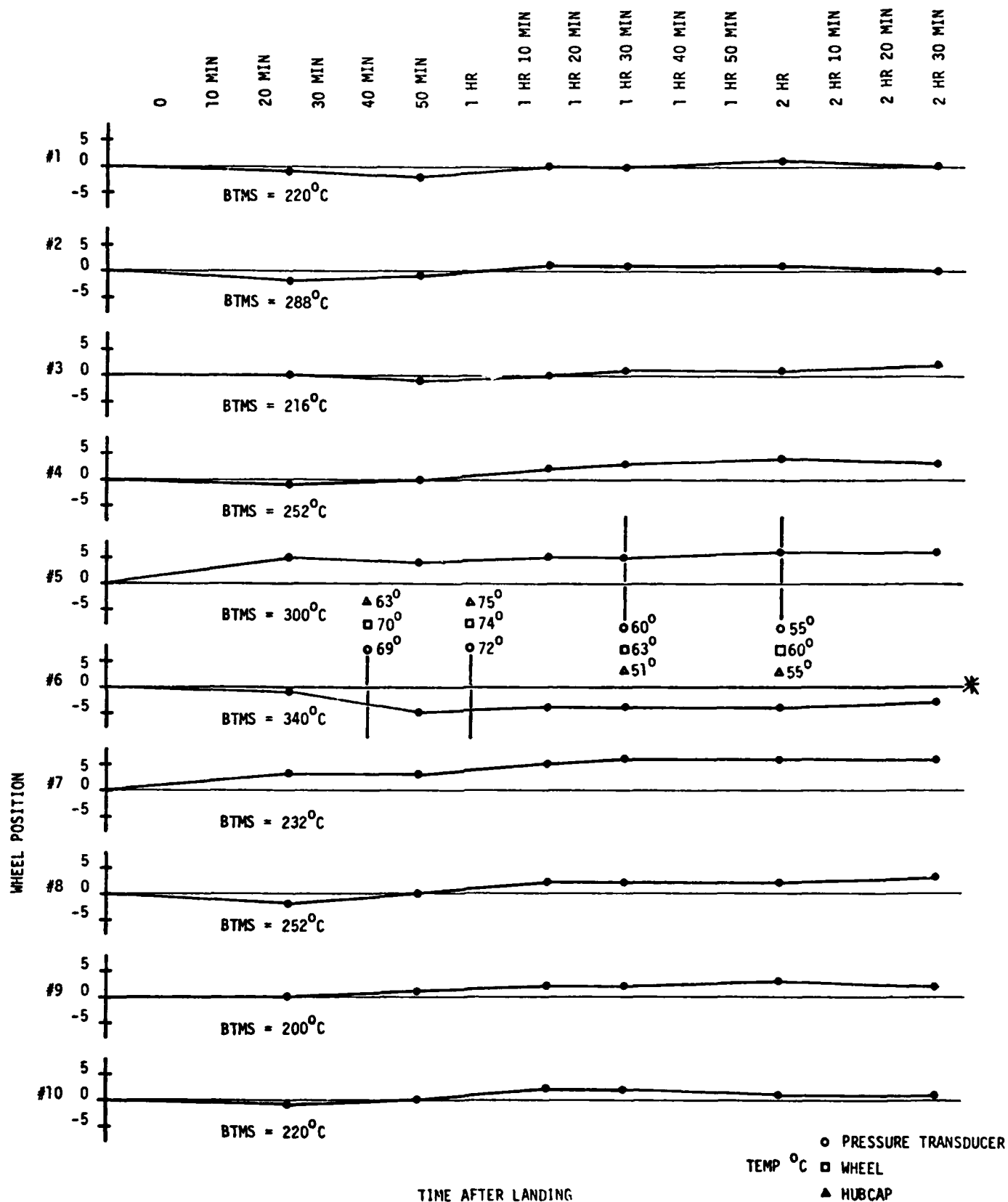


FIGURE 16. TYPICAL TIRE PRESSURE PROFILE



* NOTE: KULITE PRESSURE TRANSDUCER WAS INSTALLED ON WHEEL #6. THE REST OF THE WHEELS USED THE BOURNS PRESSURE TRANSDUCER.

FIGURE 17. HARD BRAKING EVALUATION: FAIRCHILD SYSTEM ACCURACY

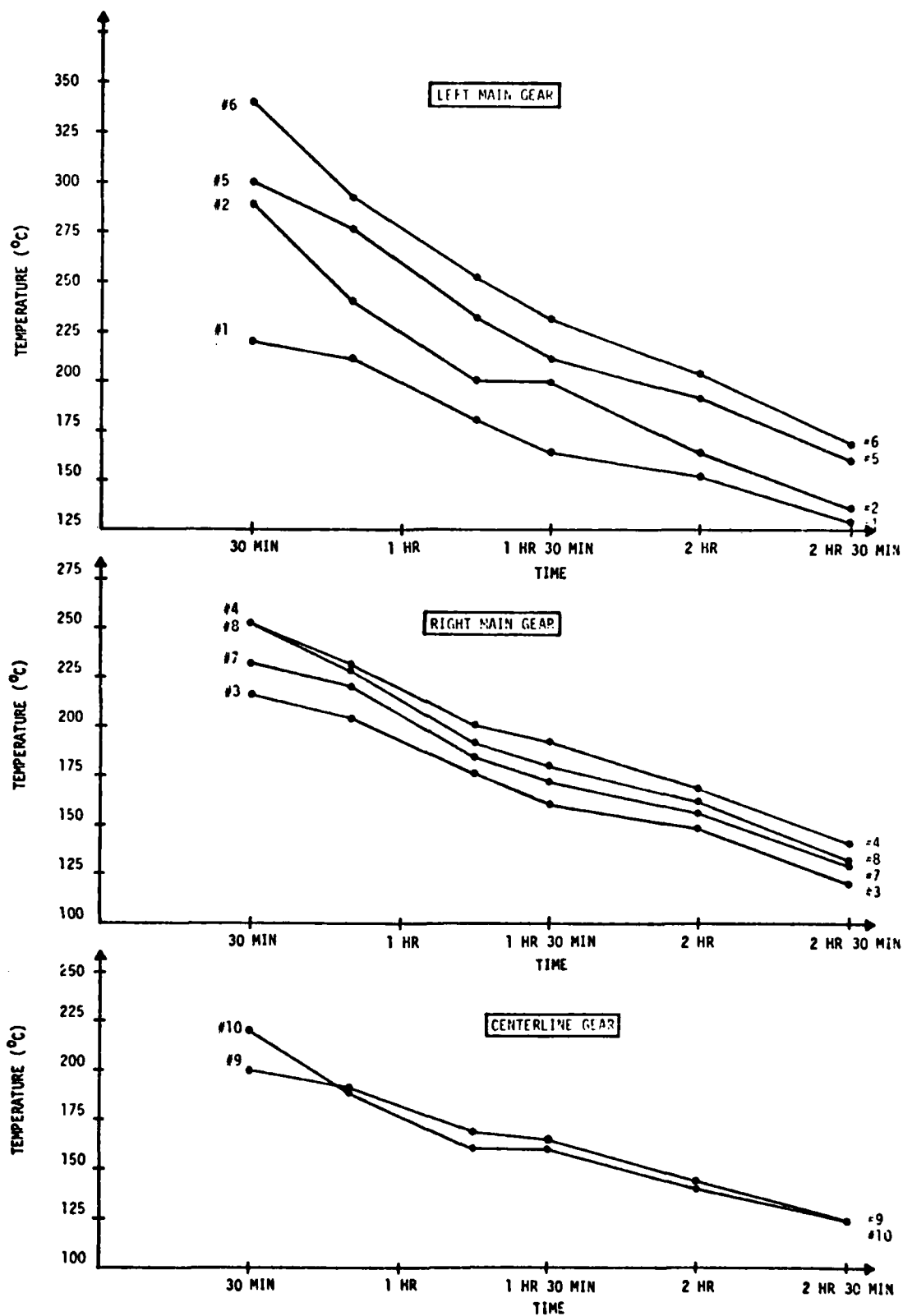


FIGURE 18. HARD BRAKING EVALUATION: BRAKE TEMPERATURE VERSUS TIME AFTER LANDING

PRODUCTION SYSTEM

SOURCE SELECTION

After years of study, development, and testing, Douglas believes that a TPI system is an attractive and worthwhile addition to the DC-10. Based on the in-service testing results and supplier proposals, Douglas has selected Fairchild to manufacture the TPI system. Douglas is working closely with Fairchild on the production system to be offered to the airlines.

Swissair, which was responsible for the in-service test, became the first airline to place an order for the TPI system. Two new Swissair aircraft, to be assembled at Long Beach, California, will be equipped with the Fairchild TPI system. Douglas will coordinate the installation, including all necessary wiring, conduit routing, and TPI hardware. In addition, Swissair has placed an order for a TPI kit retrofit on all DC-10s in its fleet.

PRODUCTION SYSTEM DESCRIPTION

In order to deliver the TPI system hardware to the airlines by the end of 1982, a TPI production development program must start immediately. The Fairchild system used in the in-service test evaluation is very close to a production system, although several important modifications must be made. The system concept remains the same as before.

During the in-service test evaluation, low tire pressure warnings occurred quite frequently due to marginal differential pressure settings. The Goodyear system allowed a pressure difference of 30 psi between the axle-mate tires while Fairchild allowed 15 percent. This created a nuisance warning as tire pressure rose due to brake heat dissipation. The tire pressure readings have a tendency to scatter if the tires get warm and the pressures rise. This causes low tire

pressure warning indications which are undesired since the lower pressure is still above the standard inflation pressure and therefore the lower wheel is still capable of carrying its share of the gear load. Moreover, uneven cooling in the wheel well tends to diverge the tire pressures. Revision of the differential pressure threshold to 20 percent would considerably reduce the probability of undesired low tire pressure warnings at elevated temperatures. Figure 19 illustrates the undesired warnings based on each respective setting.

The low tire pressure warning indication will be integrated with the master caution and overhead TIRE PRESS LOW annunciator lights. This allows the warning to appear during takeoff as the flight crews are facing forward. The system is so designed that any and all warnings will be frozen at ground speed above 60 knots. Any new warning will not be illuminated. This is to prevent an undesirable warning indication when approaching takeoff speed. As soon as the wheel speed goes below 60 knots, the inhibit function will be deactivated. It will again assume its low tire pressure warning capability in flight. In the event of a low tire, the appropriate LOW light will illuminate with the corresponding tire pressure displayed. When more than one tire is low, the lowest tire pressure value will be displayed. This automatic low tire pressure readout will enable the flight crew to distinguish flat tires from low tires.

The TPI system hardware must be modified slightly. The final configuration will be a fully developed production system. Details of these changes are provided below.

1. From the in-service test evaluation, the disconnect of the pressure transducer will be located at the hubcap interface. Because of the antiskid wheel speed transducer modification, the special TPI hubcap (with electronics and bellows coupling assembly inside) must stay with the aircraft despite wheel replacement. It should be noted that the hubcap is being driven by the spline shaft coupling instead

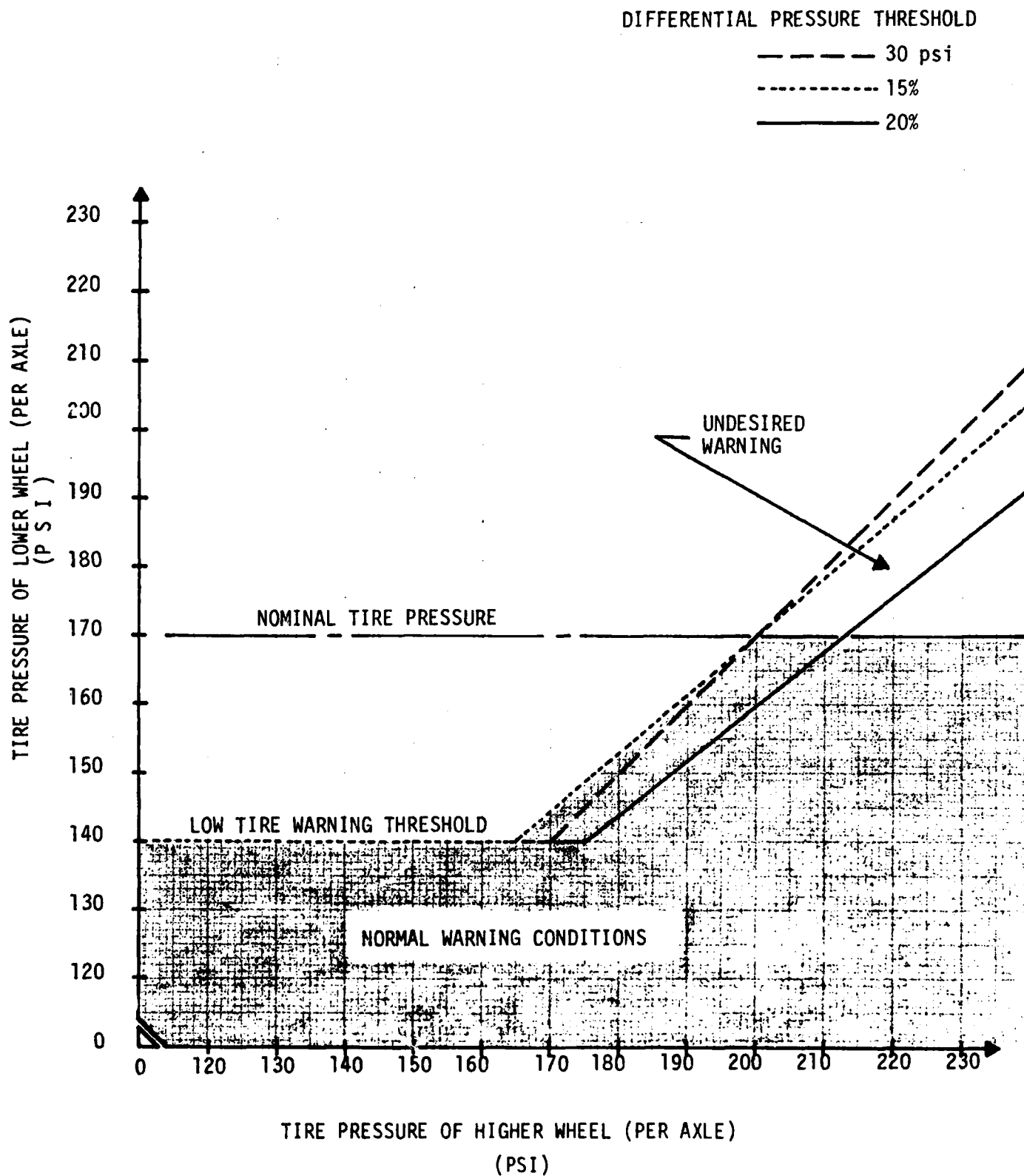


FIGURE 19. DIFFERENTIAL PRESSURE FOR LOW TIRE WARNING

of the drive arm assembly. During in-service test, the special hubcap potted with the braided tubing assembly will not be allowed to be installed without a pressure transducer. With the disconnect defined at the hubcap interface, the braid tubing assembly will be potted with the pressure transducer as one unit-piece. This will permit the special hubcap to be installed without a pressure transducer. In addition, no connector alignment tool is required, which will save considerable installation time. The final production wheel installation is shown in Figure 20 for the nose wheel and in Figure 21

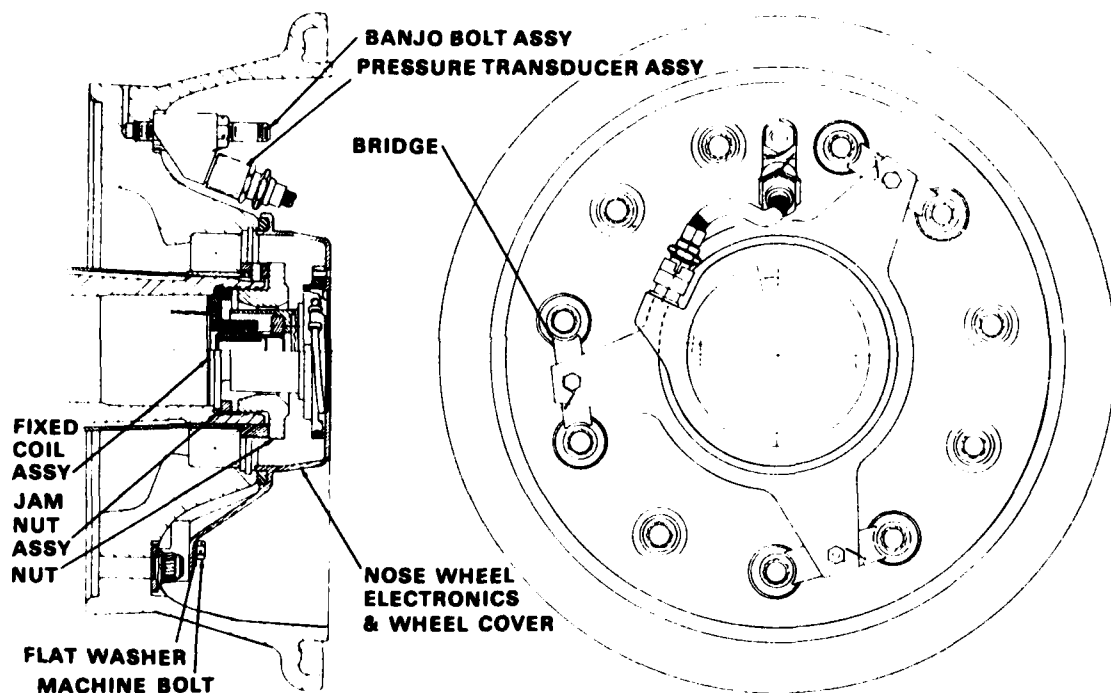


FIGURE 20. TPI NOSE WHEEL INSTALLATION (PRODUCTION)

for the main wheel.

2. The system computer unit is a standard 1/2 ATR short enclosure (see Figure 22). It houses the electronics which perform all computations and control functions for the entire system. The low tire pressure threshold setting switches are located on the front panel of the system computer. There are three banks of thumbwheel

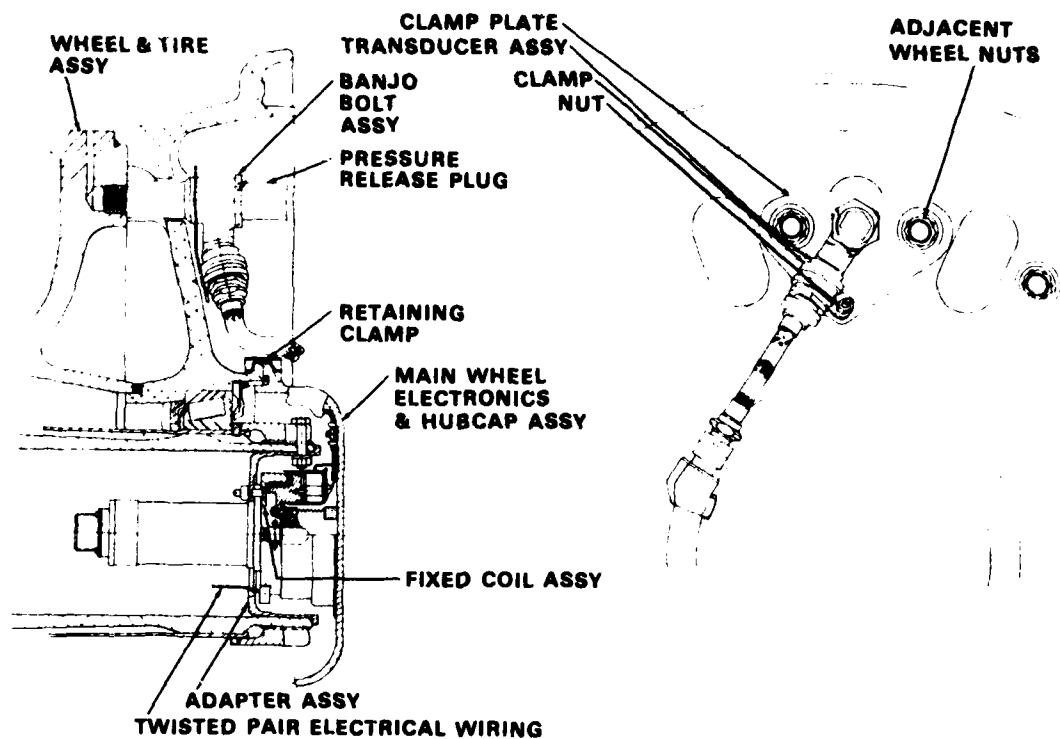


FIGURE 21. TPI MAIN WHEEL INSTALLATION (PRODUCTION)

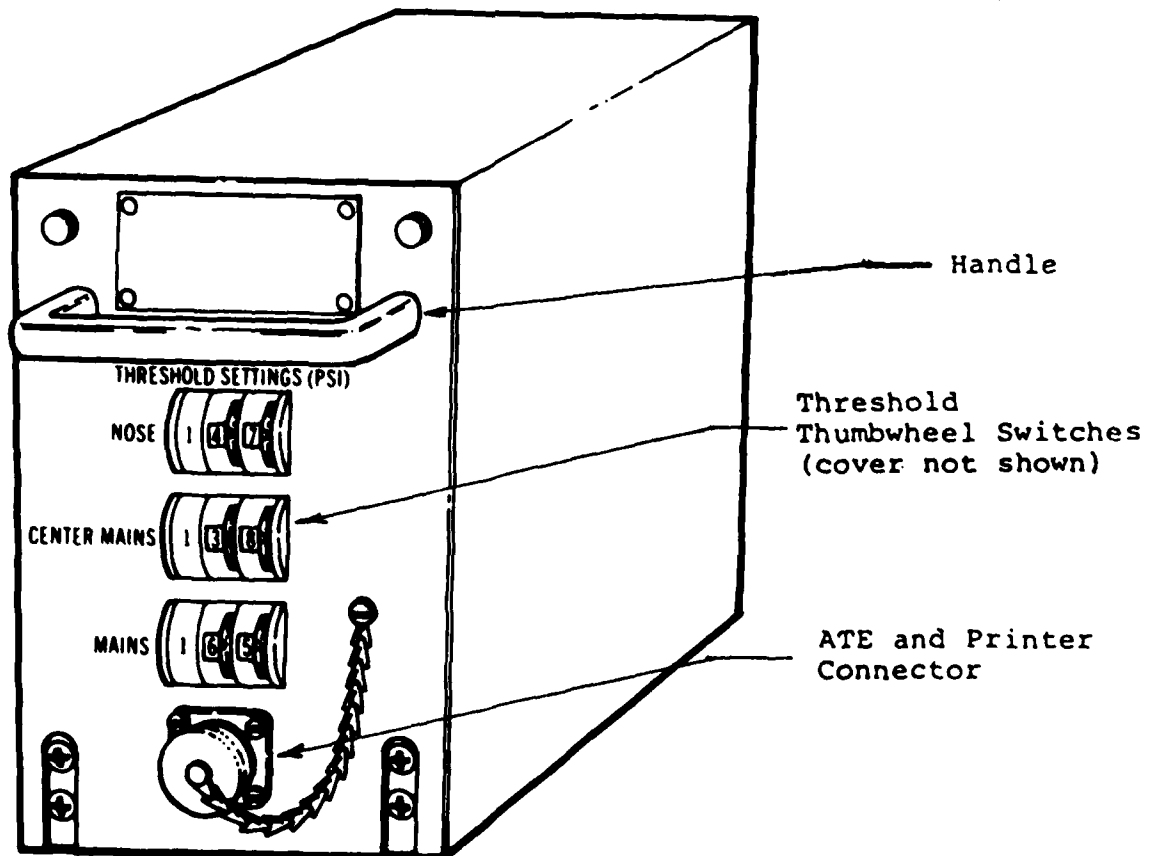


FIGURE 22. BTM/TPI SYSTEM COMPUTER (PRODUCTION)

switches; one set each for the main gear, the center main gear, and the nose gear. The settings are made in direct reading psi. The most significant figure is a fixed one (100 psi) because it is not anticipated that any threshold will be below 100 psi. The threshold setting range will therefore be between 101 and 199 psi. The thumbwheel switches will be in BCD code to the system computer. Since some airlines may prefer not to have a TPI installation on the nose wheel, the nose wheel thumbwheel switches can be set to 100 psi to eliminate that wheel's information. In addition, if the wheel components of any gear are known to be faulty, a 100-psi setting for that gear will eliminate the known fault light. This will provide the flight crew with a more pleasant feeling as a fault light will not illuminate. It also allows the system to warn the flight crew of another faulty condition. A transparent cover guard will be provided to protect the switches from being inadvertently set by maintenance personnel and still be easily read.

The front panel of the system computer provides a receptacle for an optional printer connection. A portable printer, shown in Figure 23,



FIGURE 23. BTM/TPI SYSTEM PRINTER

has the capability of the pressure printouts for preflight and postflight records.

3. The cockpit display panel, shown in Figure 24, has the combined

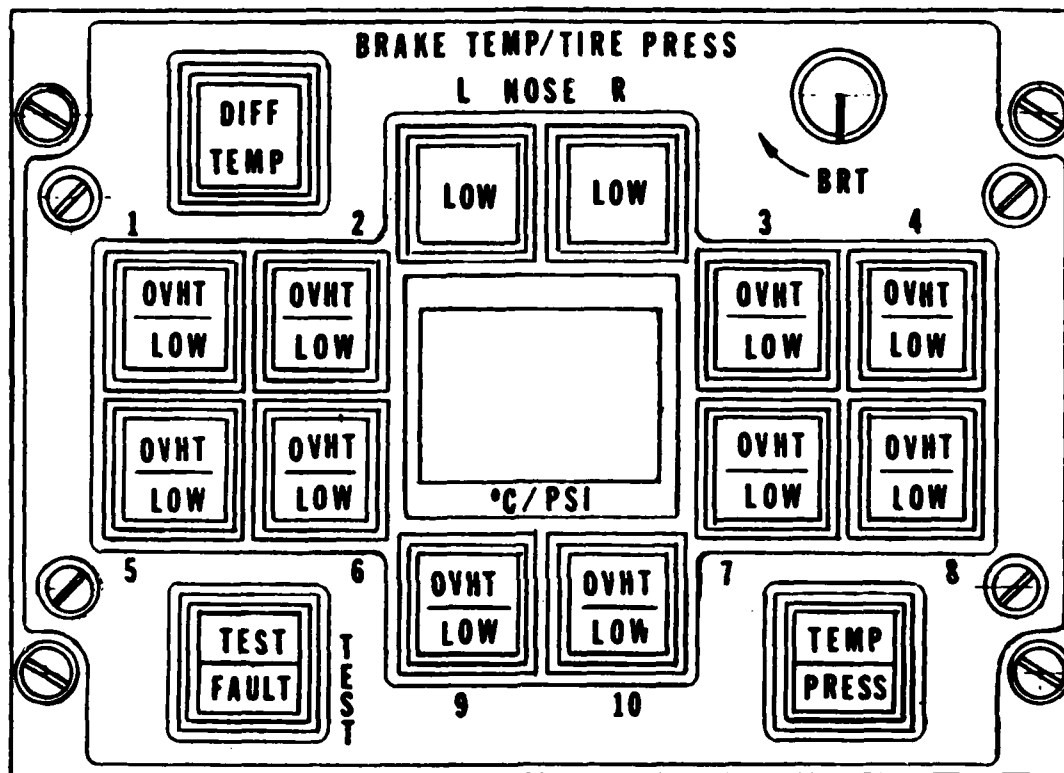


FIGURE 24. COCKPIT DISPLAY PANEL (PRODUCTION)

features resulting from the Goodyear and Fairchild in-service testing. The front face of the panel features a three-digit, seven-segment display, an indicator/switch for each wheel, a mode selector switch, a differential temperature indicator, and a TEST/FAULT switch. The displays operate in the same manner as in the in-service evaluation. With the system computer continuously monitoring the function of the system, the FAULT light will illuminate when a malfunction is detected. Depressing the TEST/FAULT switch will cause all wheel lights to illuminate and the number 888 to be displayed on the digital indicator. Upon release of the switch, the digital display will identify the faulty component. For example, "b1"

will be displayed for a failed brake temperature sensor in wheel No. 1, and "F1" for a failed tire pressure transducer in wheel No. 1. Multiple failures are indicated sequentially in the same manner. Depressing the TEST/FAULT switch once more will remove the display of fault information. However, the fault light will remain illuminated until corrective action is taken.

IN-HOUSE INSTALLATION AND FAA CERTIFICATION

Since the TPI system is brand new, it must be certified by the FAA. Certification involves FAA conformity inspection, acceptance tests, flight test and qualification tests. The FAA conformity inspection will include all parts used in qualification tests. The acceptance test, required for each production system before the production hardware is delivered, involves visual examination, dielectric strength, insulation resistance, functional performance, and burn-in tests. A flight test is required for FAA final approval and certification. The purpose of qualification tests is to provide Douglas with a level of confidence that the items defined by the specification may be used as intended. Many tests are performed, such as environmental, electromagnetic interference, power variation and transients, and endurance tests.

Two TPI system shipsets are needed to complete the installation on two Swissair aircraft. Douglas intends to use the first Swissair aircraft for FAA certification. No problems occurred during the installation. All wheels equipped with the TPI wheel component kit completed the required 24-hour pressure leakage test. Appendix C shows the actual step-by-step installation procedure for the nose wheel and the main wheel. In addition, different views of both the cockpit display panel and the system computer are included.

After the installation, an on-aircraft-test-procedure (OATP) was followed to verify the system installation and function. Several

minor problems were discovered during the functional check. First, the thumbwheel switches at the front panel of the system computer did not function properly. The low tire pressure threshold setting had no effect on the system operation. Second, the tire pressure readout did not display the lowest of the illuminated low tires, but instead the lowest among all the tires. This could provide a nuisance indication because the nominal tire pressure setting for each gear is different. These faulty conditions were resolved by modifying the system software.

A significant problem arose when several pressure transducers malfunctioned. The cockpit display panel displayed the FAULT light, which proved the system fault isolation capability. It was found that the lead wires in the braided tubing assembly were pinched. This was probably due to an incorrect method of assembling the unit together. The pinched wires caused the intermittent ground to the case. This problem is being pursued and Douglas is confident that a solution will be found.

The FAA certification was completed in early 1982. A flight test was made to obtain the certification. Several taxi tests were made to verify the system component integrity, a few tires were deflated to ensure the system low tire detection capability, and the cockpit readout was compared with readings of a hand-held tire pressure gauge to determine the system's accuracy and prove noninterference with other systems.

CONCLUSION

The TPI system concepts were studied and evaluated in year-long in-service tests. The tests demonstrated the feasibility of the cockpit tire pressure indicating system. The Fairchild system was selected for introduction into future airline operation. With airline interest, a promising market can be foreseen. Although tire design will continuously improve as well as tire maintenance, tire failure

remains a possibility. Tire failure incidents are suspected to have been triggered by undetected underinflated or flat tires, which probably could have been prevented if a TPI system had been operating in the cockpit at the time. The introduction of the tire pressure indicating system marks the end of years of study of a feature that will improve tire maintenance and safety in the aviation industry.

APPENDIX A

GOODYEAR SYSTEM IN-SERVICE EVALUATION DATA

APPENDIX A

DC-10 TIRE PRESSURE INDICATING SYSTEM HB-IHB (FUS. #73) GOODYEAR SYSTEM TIRE PRESSURE ACCURACY READOUT

DATE	OUTSIDE AIR TEMP (°C)	TIRE PRESSURE READOUT (PSI)									
			1	2	3	4	5	6	7	8	9 10
3/1/80	23°	GAUGE (N)	180	180	180	180	180	180	180	180	155 155
		COCKPIT	180	178	182	182	180	182	178	184	160 164
		DELTA	0	-2	+2	+2	0	+2	-2	+4	+5 +9
3/3/80	20°	GAUGE (N)	174	174	169	171	174	174	172	172	149 151
		COCKPIT	178	176	176	176	174	180	174	178	154 158
		DELTA	+4	+2	+7	+5	0	+6	+2	+6	+5 +7
3/5/80	18°	GAUGE (N)	171	171	169	168	171	171	169	169	149 146
		COCKPIT	178	174	176	174	174	178	174	174	152 156
		DELTA	+7	+3	+7	+6	+3	+7	+5	+5	+3 +10
3/8/80	18°	GAUGE (C)	173	173	172	172	173	173	173	172	150 150
		COCKPIT	178	174	176	174	174	178	174	176	154 158
		DELTA	+5	+1	+4	+2	+1	+5	+1	+4	+4 +8
3/9/80	20°	GAUGE (C)	173	172	172	179	173	177	172	172	149 150
		COCKPIT	178	172	176	182	174	180	174	178	154 160
		DELTA	+5	0	+4	+3	+1	+3	+2	+6	+5 +10
3/11/80	16°	GAUGE (C)	175	178	175	181	175	175	177	177	151 150
		COCKPIT	180	178	182	182	174	178	176	180	154 158
		DELTA	+5	0	+7	+1	-1	+3	-1	+3	+3 +8
3/13/80	17°	GAUGE (C)	177	178	177	182	177	179	177	177	152 152
		COCKPIT	182	178	184	186	178	184	178	182	158 160
		DELTA	+5	0	+7	+4	+1	+5	+1	+5	+6 +8
3/14/80	9°	GAUGE (N)	179	179	175	179	180	179	179	175	155 152
		COCKPIT	180	172	178	180	176	180	178	178	158 158
		DELTA	+1	-7	+3	+1	-4	+1	-1	+3	+3 +6
3/16/80	18°	GAUGE (N)	176	177	175	180	177	177	176	175	154 154
		COCKPIT	178	176	176	182	174	178	174	178	154 158
		DELTA	+2	-1	+1	+2	-3	+1	-2	+3	0 +4
3/22/80	10°	GAUGE (N)	178	176	176	179	175	176	174	172	151 151
		COCKPIT	174	172	172	172	174	174	174	176	156 158
		DELTA	-4	-4	-4	-7	-1	-2	0	+4	+5 +7
3/23/80	6°	GAUGE (N)	178	193	174	178	179	178	172	172	149 149
		COCKPIT	180	194	174	176	176	180	174	174	152 156
		DELTA	+2	+1	0	-2	-3	+2	+2	+2	+3 +7

C = DATA PROVIDED BY CALIBRATED HAND-HELD GAUGE, ± 2 PSI

N = DATA PROVIDED BY NONCALIBRATED HAND-HELD GAUGE, ± 4 PSI

C^o = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)									
			1	2	3	4	5	6	7	8	9	10
3/25/80	12°	GAUGE (N)	186	191	182	189	182	182	182	182	156	159
		COCKPIT	182	190	184	188	176	182	178	184	158	162
		DELTA	-4	-1	+2	-1	-6	0	-4	+2	+2	+3
3/27/80	9°	GAUGE (N)	176	179	179	179	176	181	182	178	179	182
		COCKPIT	178	180	180	180	178	182	185	178	180	185
		DELTA	+2	+1	+1	+1	+2	+1	+3	0	+1	+3
3/29/80	16°	GAUGE (N)	193	188	189	192	182	191	182	192	156	155
		COCKPIT	190	190	194	192	182	190	182	198	160	158
		DELTA	-3	+2	+5	0	0	-1	0	+6	+4	+3
4/1/80	23°	GAUGE (N)	188	185	185	188	171	189	178	189	152	156
		COCKPIT	180	182	188	188	170	196	176	192	154	158
		DELTA	-8	-3	+3	0	-1	+7	-2	+3	+2	+2
4/6/80	15°	GAUGE (N)	175	182	183	185	178	178	178	185	152	151
		COCKPIT	168	180	184	180	174	188	176	188	152	154
		DELTA	-7	-2	+1	-5	-4	+10	-2	+3	0	+2
4/6/80	5°	GAUGE (N)	178	185	182	188	179	178	178	188	149	151
		COCKPIT	170	180	182	182	174	188	174	188	150	155
		DELTA	-8	-5	0	-6	-5	+10	-4	0	+1	+4
4/9/80	20°	GAUGE (C)	171	176	179	180	174	173	171	181	147	149
		COCKPIT	166	178	182	176	174	186	172	184	148	152
		DELTA	-5	+2	+3	-4	0	+13	+1	+3	+1	+3
4/9/80	19°	GAUGE (C)	171	176	179	182	175	173	173	182	146	148
		COCKPIT	166	176	180	176	174	186	172	184	148	152
		DELTA	-5	0	+1	-6	-1	+13	-1	+2	+2	+4
4/13/80	16°	GAUGE (N)	185	191	191	193	188	189	183	193	156	158
		COCKPIT	182	192	194	192	184	200	182	198	160	162
		DELTA	-3	+1	+3	-1	-4	+11	-1	+5	+4	+4
4/15/80	20°	GAUGE (N)	176	182	182	182	179	179	182	183	168	152
		COCKPIT	172	186	186	184	180	194	174	188	168	154
		DELTA	-4	+4	+4	+2	+1	+15	-8	+5	0	+2
4/16/80	17°	GAUGE (N)	174	180	180	181	179	176	171	181	154	150
		COCKPIT	168	182	184	178	178	190	174	188	156	154
		DELTA	-6	+2	+4	-3	-1	+14	+3	+7	+2	+4
4/18/80	15°	GAUGE (N)	176	183	183	183	178	182	175	185	154	152
		COCKPIT	166	182	180	176	172	190	170	182	154	154
		DELTA	-10	-1	-3	-7	-6	+8	-5	-3	0	+2

C = DATA PROVIDED BY CALIBRATED HAND-HELD GAUGE, ± 2 PSI

N = DATA PROVIDED BY NONCALIBRATED HAND-HELD GAUGE, ± 4 PSI

C# = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)									
			1	2	3	4	5	6	7	8	9	10
4/19/80	170	GAUGE (N)	172	182	179	180	179	180	170	179	152	150
		COCKPIT	170	186	172	176	178	198	172	182	156	154
		DELTA	-2	+4	-7	-4	-1	+18	+2	+3	+4	+4
4/23/80	80	GAUGE (N)	178	175	176	180	174	175	172	175	150	153
		COCKPIT	174	180	180	180	174	190	184	174	156	158
		DELTA	-4	+5	+4	0	0	+15	+12	-1	+6	+5
5/1/80	200	GAUGE (N)	179	182	180	182	185	185	185	190	152	160
		COCKPIT	170	182	174	182	184	198	196	186	156	166
		DELTA	-9	0	-6	0	-1	+13	+11	-4	+4	+6
5/3/80	150	GAUGE (N)	178	179	178	178	185	185	182	185	152	156
		COCKPIT	170	182	172	180	182	196	194	184	156	158
		DELTA	-8	+3	-6	+12	-3	+11	+12	-1	+4	+2
5/5/80	250	GAUGE (N)	178	179	176	179	182	181	182	186	165	158
		COCKPIT	166	178	168	180	176	194	190	182	150	158
		DELTA	-12	-1	-8	+1	-6	+13	+8	-4	-15	0
5/8/80	80	GAUGE (N)	185	185	178	179	186	189	183	188	155	162
		COCKPIT	174	186	170	178	186	198	194	184	156	162
		DELTA	-11	+1	-8	-1	0	+9	+11	-4	+1	0
5/10/80	140	GAUGE (N)	185	185	186	189	189	188	195	195	159	158
		COCKPIT	178	186	186	190	188	198	206	196	160	168
		DELTA	-7	+1	-2	+1	-1	+10	+11	+1	+1	+10
5/11/80	190	GAUGE (N)	178	181	178	181	196	185	185	178	149	156
		COCKPIT	170	184	170	182	188	198	194	186	156	160
		DELTA	-8	+3	-8	+1	-8	+13	+9	+8	+7	+4
5/13/80	190	GAUGE (C)	185	185	175	176	182	180	182	185	148	155
		COCKPIT	180	INOP	170	INOP	182	INOP	194	184	154	160
		DELTA	-5	(?)	-5	(?)	0	(?)	+12	-1	+6	+5
5/15/80	180	GAUGE (C)	178	175	172	176	180	178	180	182	148	152
		COCKPIT	178	174	168	176	180	192	196	182	152	158
		DELTA	0	-1	-4	0	0	+14	+16	0	+4	+6
5/15/80	200	GAUGE (C)	182	182	189	181	184	184	184	188	150	160
		COCKPIT	182	180	184	184	186	198	196	186	156	164
		DELTA	0	-2	-5	+3	+2	+14	+12	-2	+6	+4
5/17/80	210	GAUGE (C)	173	171	181	174	179	180	179	181	147	152
		COCKPIT	176	172	178	176	172	182	194	178	152	158
		DELTA	+3	+1	-3	+2	-7	+2	+15	-3	+5	+6

C = DATA PROVIDED BY CALIBRATED HAND-HELD GAUGE, ± 2 PSI
 N = DATA PROVIDED BY NONCALIBRATED HAND-HELD GAUGE, ± 4 PSI
 C* = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)									
			1	2	3	4	5	6	7	8	9	10
5/18/80	25°	GAUGE (C)	181	182	188	181	181	184	184	188	151	141
		COCKPIT	180	180	180	184	184	192	198	186	156	160
		DELTA	-1	-2	-8	+3	+3	+12	+14	-2	+5	+19
8/12/80	21°	GAUGE (C*)	178	174	190	179	176	167	178	170	159	150
		COCKPIT	170	180	192	182	174	172	182	176	158	---
		DELTA	-8	+6	+2	+3	-2	+5	+4	+6	-1	(?)
8/14/80	21°	GAUGE (N)	179	179	193	181	192	179	193	176	162	164
		COCKPIT	168	184	194	184	196	182	---	180	160	---
		DELTA	-11	+5	+1	+3	+4	+3	(?)	+4	-2	(?)
8/15/80	25°	GAUGE (N)	193	193	205	193	208	192	199	189	176	174
		COCKPIT	174	184	200	188	198	192	192	184	166	208
		DELTA	-19	-9	-5	-5	-10	0	-7	-5	-10	+34
8/17/80	23°	GAUGE (N)	185	182	200	192	195	185	192	189	170	170
		COCKPIT	166	186	204	194	200	188	194	188	170	---
		DELTA	-19	+4	+4	+2	+5	+3	+2	-1	0	(?)
8/19/80	17°	GAUGE (N)	179	179	195	185	186	181	185	181	164	162
		COCKPIT	168	180	194	182	186	182	186	180	160	---
		DELTA	-11	+1	-1	-3	0	+1	+1	-1	-4	(?)
8/20/80	24°	GAUGE (N)	193	179	190	186	193	169	186	183	166	166
		COCKPIT	---	182	194	190	192	184	184	182	160	---
		DELTA	(?)	+3	-2	+4	-1	+15	-2	-	-6	(?)
8/23/80	18°	GAUGE (N)	186	181	185	185	193	185	195	182	165	162
		COCKPIT	---	180	196	192	198	188	188	184	162	---
		DELTA	(?)	-1	+11	+7	+5	+3	-7	+2	-3	(?)
8/25/80	22°	GAUGE (C*)	179	180	184	180	182	181	181	178	159	155
		COCKPIT	164	180	188	180	182	182	184	178	158	260
		DELTA	-15	0	+4	0	0	+1	+3	0	-1	+105
8/27/80	18°	GAUGE (N)	188	188	192	189	185	188	189	185	171	159
		COCKPIT	---	186	196	192	176	192	190	184	166	---
		DELTA	(?)	-2	+4	+3	-9	+4	+1	-1	-5	(?)
8/30/80	20°	GAUGE (N)	192	191	199	192	183	189	195	192	174	162
		COCKPIT	---	186	204	192	180	196	196	186	176	---
		DELTA	(?)	-5	+5	0	-3	+7	+1	-6	+2	(?)
8/31/80	16°	GAUGE (N)	180	182	185	184	172	182	180	178	165	152
		COCKPIT	---	180	188	184	164	186	184	174	170	---
		DELTA	(?)	-2	+3	0	-8	+4	+4	-4	+5	(?)

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C* = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

DATE	OUTSIDE AIR TEMP (°C)	TIRE PRESSURE READOUT (PSI)										
			1	2	3	4	5	6	7	8	9	10
9/2/80	20°	GAUGE	185	187	191	195	181	186	188	187	169	162
		COCKPIT	---	186	194	196	172	186	188	186	178	---
		DELTA	(?)	-1	+3	+1	-9	0	0	-1	+9	(?)
9/4/80	22°	GAUGE (N)	182	175	182	185	175	175	182	171	153	153
		COCKPIT	176	---	188	192	166	182	188	178	150	150
		DELTA	-6	(?)	+6	+7	-9	+7	+6	+7	-3	-3
9/9/80	14°	GAUGE (C)	175	172	182	182	169	168	178	173	148	153
		COCKPIT	172	170	184	188	164	176	188	172	154	156
		DELTA	-3	-2	+2	+6	-5	+8	+10	-1	+6	+3
9/13/80	23°	GAUGE (N)	185	179	192	183	182	183	179	189	155	158
		COCKPIT	180	182	188	186	172	184	186	184	158	158
		DELTA	-5	+3	-4	+3	-10	+1	+7	-5	+3	0
9/15/80	18°	GAUGE (C)	186	180	180	184	180	181	179	197	153	157
		COCKPIT	182	---	180	186	174	186	186	190	162	160
		DELTA	-4	(?)	0	+2	-6	+5	+7	-7	+9	+3
9/17/80	22°	GAUGE (N)	186	182	179	182	181	183	179	198	155	159
		COCKPIT	186	186	182	184	176	188	190	194	158	160
		DELTA	0	+4	+3	+2	-5	+5	+11	-4	+3	+1
9/18/80	20°	GAUGE (N)	196	198	186	193	191	193	188	206	159	162
		COCKPIT	190	194	186	188	182	184	188	196	164	166
		DELTA	-6	-4	0	-5	-9	-9	0	-10	+5	+4
9/20/80	13°	GAUGE (N)	180	180	180	182	180	181	180	197	162	168
		COCKPIT	182	180	180	184	178	183	184	192	162	160
		DELTA	+2	0	0	+2	-2	+2	+4	-5	0	-8
9/23/80	20°	GAUGE (N)	187	188	183	184	189	188	182	200	156	156
		COCKPIT	186	190	182	184	186	190	184	192	154	156
		DELTA	-1	+2	-1	0	-3	+2	+2	-8	-2	0
9/24/80	25°	GAUGE (N)	183	182	178	188	186	182	178	193	159	161
		COCKPIT	184	184	176	190	182	186	186	192	158	160
		DELTA	+1	+2	-2	+2	-4	+4	+8	-1	-1	-1
9/27/80	17°	GAUGE (N)	178	176	178	172	179	178	191	182	156	156
		COCKPIT	178	176	176	172	170	178	198	182	156	156
		DELTA	0	0	-2	0	-9	0	+7	0	0	0
9/30/80	14°	GAUGE (C)	177	177	176	177	177	177	180	177	150	150
		COCKPIT	180	180	176	180	176	182	188	180	154	154
		DELTA	+3	+3	0	+3	-1	+5	+8	+3	+4	+4

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C# = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)									
			1	2	3	4	5	6	7	8	9	10
10/2/80	15°	GAUGE (N)	188	185	183	182	191	185	183	182	155	155
		COCKPIT	181	182	170	171	180	181	180	170	151	151
		DELTA	-7	-3	-13	-11	-11	-4	-3	-12	-4	-4
10/5/80	21°	GAUGE (N)	179	179	178	178	181	179	179	179	149	151
		COCKPIT	178	180	176	174	170	180	188	178	154	152
		DELTA	-1	+1	-2	-4	-11	+1	+9	-1	+5	+1
10/5/80	16°	GAUGE (N)	198	192	186	188	192	193	191	189	164	162
		COCKPIT	196	198	184	192	184	198	196	194	162	164
		DELTA	-2	+6	-2	+4	-8	+5	+5	+5	-2	+2
10/7/80 (HANGAR)		GAUGE (N)	183	183	182	180	179	183	182	182	152	152
		COCKPIT	180	185	180	178	176	182	186	182	156	154
		DELTA	-3	+2	-2	-2	-3	-1	+4	0	+4	+2
10/9/80	5°	GAUGE (N)	185	185	185	182	182	185	185	183	156	155
		COCKPIT	186	186	180	182	180	184	186	186	156	158
		DELTA	+1	+1	-5	0	-2	-1	+1	+3	0	+3
10/11/80	18°	GAUGE (N)	180	180	188	178	173	190	180	179	150	151
		COCKPIT	180	180	178	182	176	182	188	180	154	154
		DELTA	0	0	-10	+4	+3	-8	+8	+1	+4	+3
10/12/80	12°	GAUGE (N)	179	181	185	183	176	178	185	186	151	151
		COCKPIT	182	186	176	180	176	178	190	192	156	156
		DELTA	+3	+5	-9	-3	0	0	+5	+6	+5	+5
10/15/80	10°	GAUGE (N)	183	181	182	179	176	175	186	186	156	154
		COCKPIT	182	182	174	184	176	174	192	192	156	156
		DELTA	-1	+1	-8	+5	0	-1	+6	+6	0	+2
10/19/80	10°	GAUGE (N)	175	175	177	178	173	178	173	175	145	148
		COCKPIT	172	176	166	176	174	180	180	178	150	148
		DELTA	-3	+1	-11	-2	+1	+2	+7	+3	+5	0
10/21/80	17°	GAUGE (N)	176	175	176	178	174	178	172	178	145	142
		COCKPIT	178	176	166	178	176	174	182	180	152	150
		DELTA	+2	+1	-10	0	+2	-4	+10	+2	+7	+8
10/23/80	19°	GAUGE (N)	183	182	187	188	181	185	187	188	157	157
		COCKPIT	184	184	178	192	180	182	194	194	154	158
		DELTA	+1	+2	-9	+4	-1	-3	+7	+6	-3	+1
10/29/80	17°	GAUGE (N)	182	183	186	183	181	185	186	186	154	154
		COCKPIT	184	188	--	180	180	182	192	186	156	156
		DELTA	+2	+5	(?)	-3	-1	-3	+6	0	+2	+2

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C# = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)									
			1	2	3	4	5	6	7	8	9	10
10/31/80	200	GAUGE (N)	194	198	188	184	182	186	190	190	152	154
		COCKPIT	190	200	--	194	184	182	192	212	158	160
		DELTA	-4	+2	(?)	+10	+2	-4	+2	+22	+6	+6
11/2/80	160	GAUGE (N)	179	179	179	182	183	182	185	186	154	151
		COCKPIT	178	182	--	184	188	176	184	190	154	156
		DELTA	-1	+3	(?)	+2	+5	-6	-1	+4	0	+5
11/8/80	200	GAUGE (N)	192	192	185	192	192	199	185	185	149	149
		COCKPIT	170	182	--	194	170	180	190	--	150	150
		DELTA	-22	-10	(?)	+2	-22	-19	+5	(?)	+1	+1
11/11/80	160	GAUGE (N)	179	179	184	189	179	181	184	186	154	155
		COCKPIT	174	176	170	184	178	174	186	186	158	154
		DELTA	-5	-3	-14	-5	-1	-7	+2	0	+4	-1
11/13/80	20	GAUGE (N)	170	170	175	178	169	175	175	175	146	148
		COCKPIT	166	174	160	180	178	170	180	182	148	146
		DELTA	-4	+4	-15	+2	+9	-5	+5	+7	+2	-2
11/14/80	20	GAUGE (C)	178	176	176	176	180	176	176	176	146	146
		COCKPIT	176	182	166	180	186	172	184	180	150	148
		DELTA	-2	+6	-10	+4	+6	-4	+8	+4	+4	+2
11/14/80	10	GAUGE (N)	179	174	172	176	179	174	185	174	158	156
		COCKPIT	178	180	164	186	190	177	190	178	156	164
		DELTA	-1	+6	-8	+10	+11	-2	+5	+4	-2	+8
11/16/80	120	GAUGE (N)	185	183	181	182	186	182	181	181	154	152
		COCKPIT	182	186	170	184	188	180	184	180	150	156
		DELTA	-3	+3	-11	+2	+2	-2	+3	-1	-4	+4
11/17/80	200	GAUGE (C)	182	182	182	182	182	182	182	182	153	153
		COCKPIT	180	186	172	186	184	178	184	184	152	160
		DELTA	-2	+4	-10	+4	+2	-4	+2	+2	-1	+7
11/20/80	180	GAUGE (N)	180	183	185	190	185	180	190	182	160	159
		COCKPIT	178	184	174	184	188	176	188	184	154	160
		DELTA	-2	+1	-11	-6	+3	-4	-2	+2	-6	+1
11/21/80	200	GAUGE (N)	182	182	179	182	182	182	179	179	155	154
		COCKPIT	180	186	170	186	184	178	186	186	158	160
		DELTA	-2	+4	-9	+4	+2	-4	+7	+7	+3	+6
11/23/80	40	GAUGE (N)	180	180	182	181	189	179	182	181	155	152
		COCKPIT	176	182	170	186	178	172	190	196	150	154
		DELTA	-4	+2	-12	+5	-11	-7	+8	+15	-5	+2

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DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)									
			1	2	3	4	5	6	7	8	9	10
11/25/80	11°	GAUGE (N)	(?)	192	178	178	182	178	179	179	152	149
		COCKPIT	178	184	170	190	190	176	180	180	150	158
		DELTA	(?)	-8	-8	+12	+8	-2	+1	+1	-2	+9
11/27/80	19°	GAUGE (N)	180	181	181	180	181	180	180	181	153	153
		COCKPIT	176	179	168	184	180	174	184	184	150	158
		DELTA	-4	-2	-13	+4	-1	-6	+4	+3	-3	+5
11/28/80	18°	GAUGE (C)	175	175	176	175	178	176	176	176	152	149
		COCKPIT	166	176	166	186	190	172	178	176	148	148
		DELTA	-9	+1	-10	+11	-12	-4	+2	0	-4	-1
11/30/80	0°	GAUGE (N)	177	178	180	179	178	178	176	179	150	151
		COCKPIT	162	178	166	198	196	176	176	198	150	156
		DELTA	-15	0	-14	+19	+18	-2	0	+19	0	+5
12/1/80	20°	GAUGE (C)	176	175	185	182	175	185	182	182	148	148
		COCKPIT	168	182	--	--	--	--	186	204	144	148
		DELTA	-8	+7	(?)	(?)	(?)	(?)	+4	+22	-4	0
12/4/80	1°	GAUGE (N)	178	182	171	178	174	174	181	179	145	145
		COCKPIT	164	178	--	--	--	--	184	178	140	142
		DELTA	-14	-4	(?)	(?)	(?)	(?)	+3	-1	-5	-3
12/6/80	2°	GAUGE (N)	186	191	192	180	183	192	190	180	155	157
		COCKPIT	164	183	175	185	175	182	189	190	150	155
		DELTA	-22	-8	-17	+5	-8	-10	-1	+10	-5	-2
12/7/80	-2°	GAUGE (N)	181	186	185	182	179	188	182	183	161	164
		COCKPIT	172	188	174	194	184	182	188	184	166	164
		DELTA	-9	+2	-11	+12	+5	-6	+6	+1	+5	0
12/8/80	-4°	GAUGE (N)	172	175	174	174	171	176	174	174	152	152
		COCKPIT	--	178	166	--	--	176	184	200	152	156
		DELTA	(?)	+3	-8	(?)	(?)	0	+10	+26	0	+4
12/11/80	(?)	GAUGE (N)	183	185	188	188	182	186	188	188	165	164
		COCKPIT	--	184	170	--	--	180	182	196	156	158
		DELTA	(?)	-1	-18	(?)	(?)	-6	-6	+8	-9	-6
12/13/80	15°	GAUGE (N)	178	182	180	181	177	180	181	181	160	158
		COCKPIT	--	186	170	--	--	178	186	188	162	162
		DELTA	(?)	+4	-10	(?)	(?)	-2	+5	+7	+2	+4
12/15/80	6°	GAUGE (N)	182	183	183	185	181	181	185	183	162	161
		COCKPIT	--	180	164	--	--	174	182	178	154	158
		DELTA	(?)	-3	-19	(?)	(?)	-7	-3	-5	-8	-3

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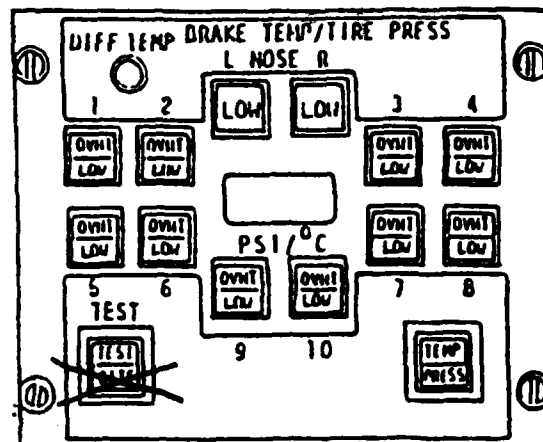
DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)									
			1	2	3	4	5	6	7	8	9	10
12/16/80	60	GAUGE (N)	174	179	178	178	175	179	179	182	156	156
		COCKPIT	--	184	166	--	--	178	188	178	156	160
		DELTA	(?)	+5	-12	(?)	(?)	-1	+9	-4	0	+4
12/18/80	180	GAUGE (N)	188	188	186	188	189	189	188	183	166	166
		COCKPIT	--	188	168	--	--	180	190	--	156	166
		DELTA	(?)	0	-18	(?)	(?)	-9	+2	(?)	-10	0
12/20/80	20	GAUGE (N)	176	179	176	178	176	178	176	171	154	156
		COCKPIT	--	182	166	--	--	176	180	--	152	158
		DELTA	(?)	+3	-10	(?)	(?)	-2	+4	(?)	-2	+2
1/3/81	50	GAUGE (N)	190	192	190	191	180	190	190	190	168	168
		COCKPIT	--	192	170	--	--	182	192	--	160	166
		DELTA	(?)	0	-20	(?)	(?)	-8	+2	(?)	-8	-2
1/5/81	20	GAUGE (N)	198	193	193	192	185	192	176	191	166	166
		COCKPIT	--	194	172	--	--	180	180	--	160	164
		DELTA	(?)	+1	-21	(?)	(?)	-12	+4	(?)	-6	-2
1/6/81	30	GAUGE (N)	183	184	185	182	180	180	180	180	165	165
		COCKPIT	--	185	174	--	--	178	180	--	165	166
		DELTA	(?)	+1	-11	(?)	(?)	-2	0	(?)	0	+1
1/8/81	-30	GAUGE (N)	183	187	185	180	178	185	179	179	161	161
		COCKPIT	--	192	172	--	--	180	182	--	158	164
		DELTA	(?)	+5	-13	(?)	(?)	-5	+3	(?)	-3	+3
1/11/81	-20	GAUGE (N)	188	198	189	185	183	193	188	185	166	161
		COCKPIT	--	194	172	--	--	182	188	--	156	162
		DELTA	(?)	-4	-17	(?)	(?)	-11	0	(?)	-10	+1
1/13/81	110	GAUGE (C)	191	196	191	186	181	191	186	186	166	156
		COCKPIT	--	198	176	--	--	182	194	--	--	162
		DELTA	(?)	+2	-15	(?)	(?)	-9	+8	(?)	(?)	+6
1/14/81	-20	GAUGE (N)	179	186	182	176	172	182	176	174	159	149
		COCKPIT	--	184	--	174	166	--	184	--	--	154
		DELTA	(?)	-2	(?)	-2	-6	(?)	+8	(?)	(?)	+5
1/16/81	00	GAUGE (N)	180	188	185	175	175	182	179	173	160	150
		COCKPIT	--	188	166	--	--	174	186	--	--	154
		DELTA	(?)	0	-19	(?)	(?)	-8	+7	(?)	(?)	+4

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TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date MARCH 2, 1980 Flight 128 Airport Code ORD

Outside Air Temp. 0°C Time of Day EVENING

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.												

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

"BITE" LIGHT ON AFTER LANDING, RECYCLING C/B B-12 RESET TO

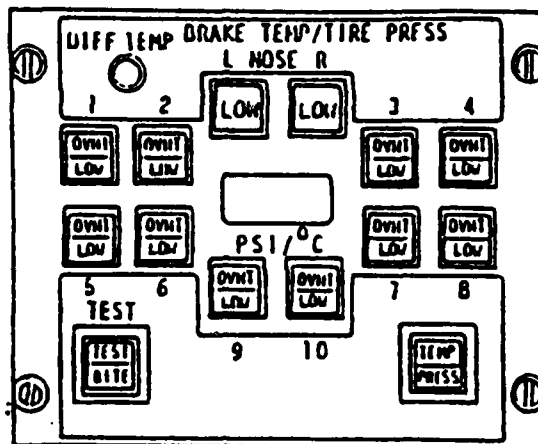
NORMAL CONDITION. (ELECTRICAL PROBLEM, MAY BE DUE TO BUS SWITCHING

FROM GENERATOR TO APU GENERATOR)

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date MARCH 6, 1981 Flight 128 Airport Code ZRH-BOS

Outside Air Temp. _____ Time of Day 1030

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.												

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

DURING COCKPIT PREPARATION, "BITE" LIGHT ON. WITH SEVERAL

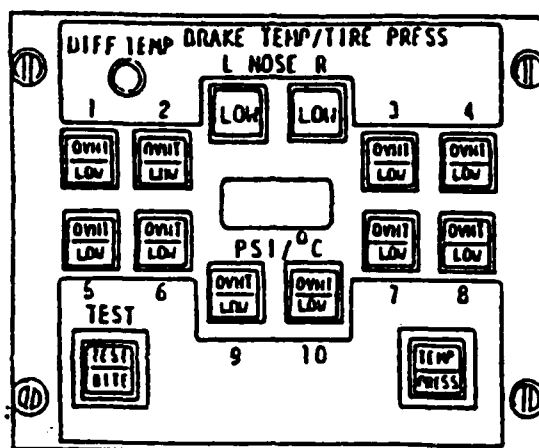
ATTEMPTS TO RESET C/B E-4, SYSTEM WAS BROUGHT BACK TO NORMAL

OPERATING MODE.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date MARCH 7, 1980 Flight 129 Airport Code BOS
Outside Air Temp. 3°C Time of Day 2215

Tire Pressures: READINGS DURING CRUISE

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	168	174	176	164	166	14	174	170	148	152	156	160

Brake Temperatures: FLUCTUATING

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

DURING PUSHBACK, TPI WHEEL #6 STARTS FLUCTUATING, ALSO LOW

LIGHT ON AND OFF. AFTER PUSHBACK, AIRCRAFT STEADY, INDICATION

SHOWS APPROXIMATELY 60 PSI, LOW LIGHT WAS ON. VISUAL TIRE PRESSURE

SHOWS NORMAL. "BITE" LIGHT IS ON FOR A MINUTE. AS SOON AS AIRCRAFT

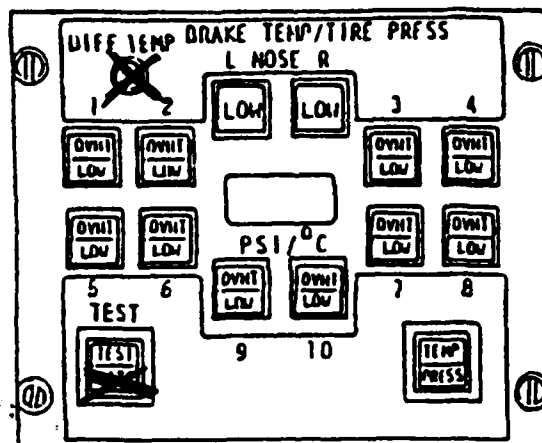
(NOTE: REMARKS CONTINUES ON THE ATTACHED PAGE.)

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

IS MOVING FORWARD, INDICATION BECOMES NORMAL AGAIN
EXCEPT THAT SLIGHT FLUCTUATIONS ARE OBSERVED DURING SHARP
TURNS. DURING TAKEOFF ROLL, INDICATION NORMAL AND
STEADY. AFTER GEAR-UP, LOW LIGHT ON AGAIN. INDICATION
FLUCTUATES BETWEEN 30 TO 60 PSI IN THE WHOLE CLIMB.
DURING CRUISE, LOW LIGHT ON AND PRESSURE INDICATION
STEADY AT 14 PSI. CYCLING OF CIRCUIT BREAKER E-4 DOES
NOT HELP. DURING DESCENT, "BITE" LIGHT ON IN PRESSURE
NODE. AFTER LANDING, SAME INDICATION AGAIN AS IN BOSTON.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date MARCH 9, 1980 Flight 284 Airport Code GVA

Outside Air Temp. 1°C Time of Day 2300

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.												

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	150	150	80	82	150	212	78	80	110	108

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

"BITE" LIGHT ON DURING TAXI-IN, AFTERWARD "DIFF TEMP" LIGHT COMES ON.

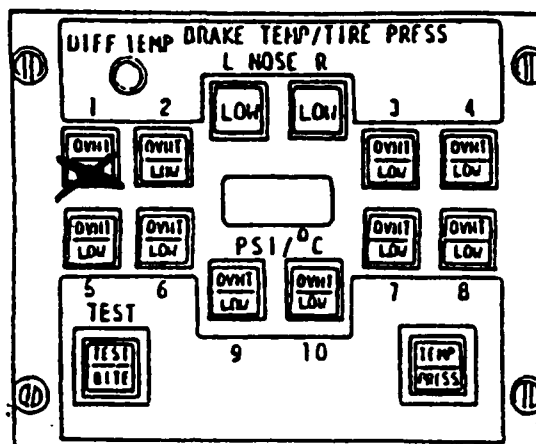
(TEMPERATURE OF WHEEL #6 IS APPROXIMATELY 60° HIGHER THAN WHEEL

#1, #2 AND #5) AFTER RESET/C/B B-12, SYSTEM WORKS NORMAL AGAIN.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date MARCH 25, 1980 Flight 147 Airport Code GVA

Outside Air Temp. 0°C Time of Day 1452

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	164											

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

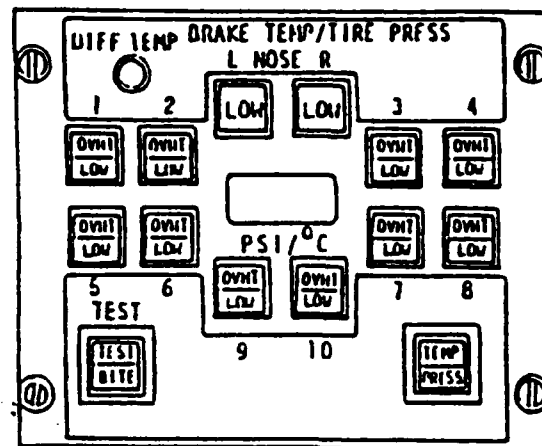
Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

OK AFTER RESETTNG C/B E-5.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date MARCH 30, 1980 Flight 188 Airport Code CMB

Outside Air Temp. 31°C Time of Day 1115

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.												

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

OVHT OVHT & BITE LIGHT ON

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

PSI/°C DIGITAL MODULE NOT ILLUMINATED EITHER IN NORMAL OR TEST

MODE. WHEN TEMPERATURE IS SELECTED, "BITE" LIGHT IS ON AND ALSO

WHEEL #9 AND #10 "OVHT" LIGHTS ON. BRAKE TEMPERATURE CHECKED BY

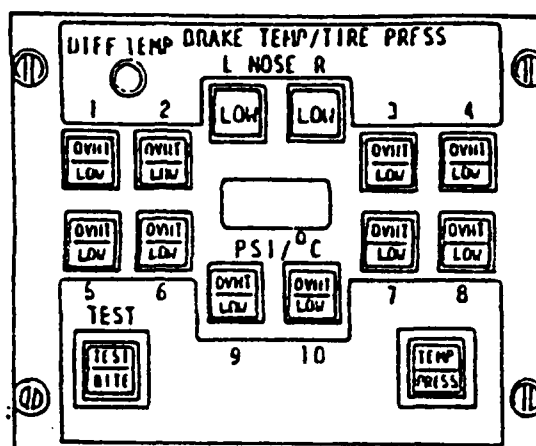
HAND FOUND NORMAL. NO SUCCESS OF C/B RESET.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR

MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date APRIL 3, 1980 Flight 332 Airport Code TLU

Outside Air Temp. 18°C Time of Day 1600

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.												

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

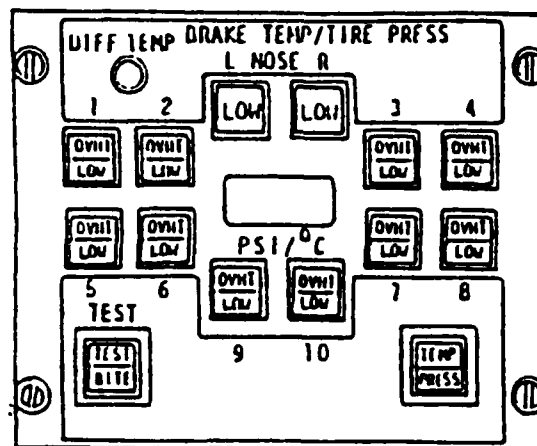
Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

AFTER LANDING AND NORMAL BRAKING, "BITE" LIGHT ON. AFTER PULL/
PUSH OF C/B, NORMAL AGAIN.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date APRIL 19, 1980 Flight 267 Airport Code LOS-ZRH

Outside Air Temp. -52°C Time of Day 0430

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	162	190	182	178	174	200	172	176	152	152	156	158

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	34	52	22	22	38	60	18	18	18	20

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

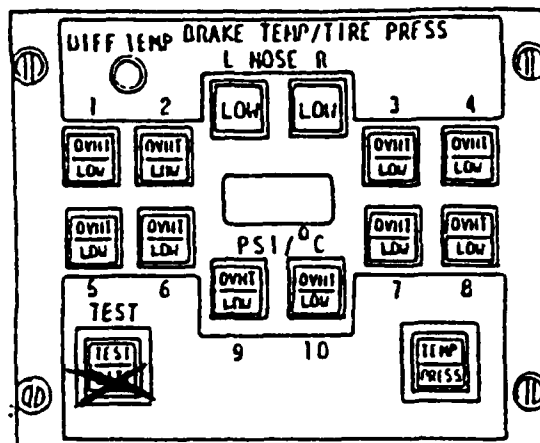
AFTER 4 HOURS FLIGHT TIME, WHEEL #1 "LOW" LIGHT FLICKERING.

(TWO TIMES)

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date APRIL 27, 1980 Flight Airport Code ZRH-BOS

Outside Air Temp. GRD=10°C/FLT=-51°C Time of Day NO DELAY

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	170	198	008	192	184	206	202	188	150	160	156	158

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

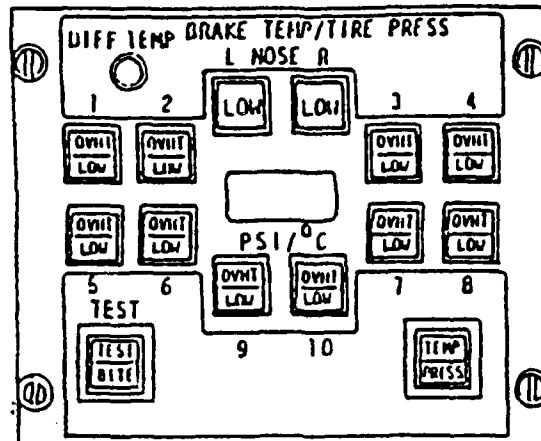
WHEEL #3 AND #4 HAVE BEEN CHANGED AT ZRH (TIRE WORN!) "BITE"

LIGHT IS ON. NO SUCCESS WITH C/B RESET.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

APRIL 31, 1980
Date MAY 1, 1980 Flight 167 Airport Code BOM - ZRH

Outside Air Temp. -35°C Time of Day 2300

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	190	222	216	220	206	228	224	212	180	194	180	182

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	80	80	80	80	80	90	70	70	70	70

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

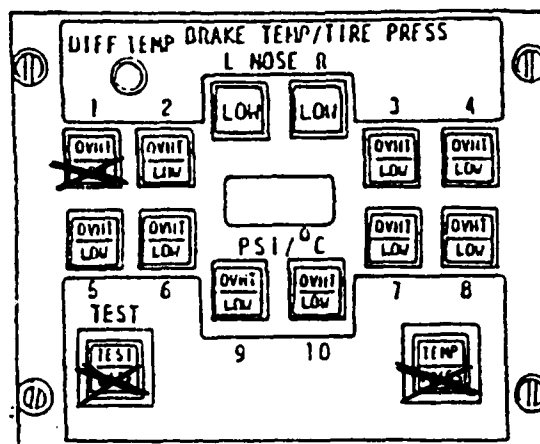
WHEEL #1 "LOW" LIGHT CAME ON 1 HOUR AFTER TAKEOFF. "LOW" LIGHT WAS
ON FOR 4 HOURS.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR

MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date MAY 10, 1980 Flight 145 Airport Code NKR -GVA
 Outside Air Temp. -42°C Time of Day 1100

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	182	496	186	194	200	210	212	204	162	168	154	158

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	46	48	52	60	48	58	52	52	46	48

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

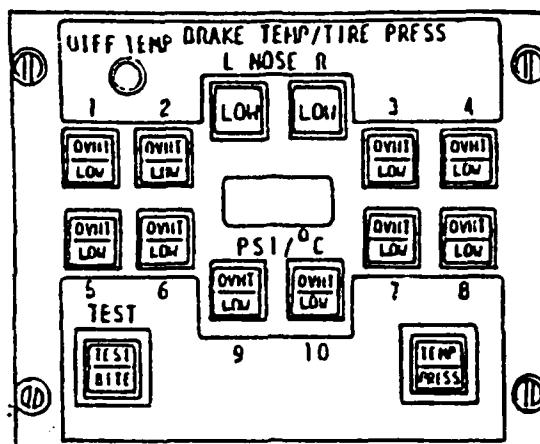
"BITE" LIGHT ON IN PRESSURE MODE. ON GROUND GVA, "LOW"

LIGHT #1 ON.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFP.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date MAY 13, 1980 Flight 147 Airport Code GIG -DKR

Outside Air Temp. -38°C Time of Day 0100

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	174	496	182	182	194	496	200	188	158	162	154	158

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

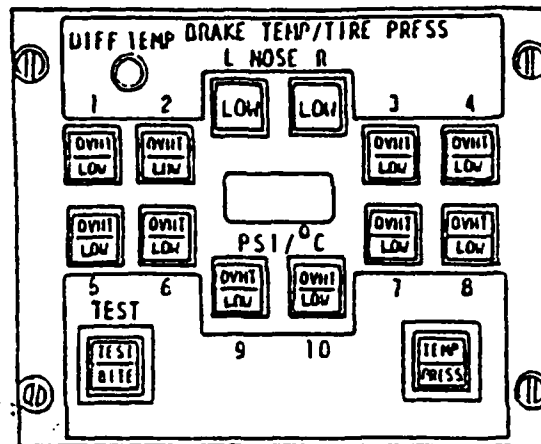
WITH PRESSURE MODE SELECTED, "BITE" ON. WITH TEMPERATURE

SELECTED, NO "BITE" ON. NO SUCCESS ON C/B RESET.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFB.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date MAY 14, 1981 Flight 146 Airport Code DKR

Outside Air Temp. 21°C Time of Day 0515

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	175	205	190	200	200	210	210	205	162	168	154	158

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	100	105	110	115	90	80	90	84	70	75

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

DURING TAXI-OUT, MAIN WHEEL #1 PRESSURE "LOW" LIGHT ON.

(PRESSURE = 175° PSI, TEMPERATURE = 100°C). GROUND CHECK BY

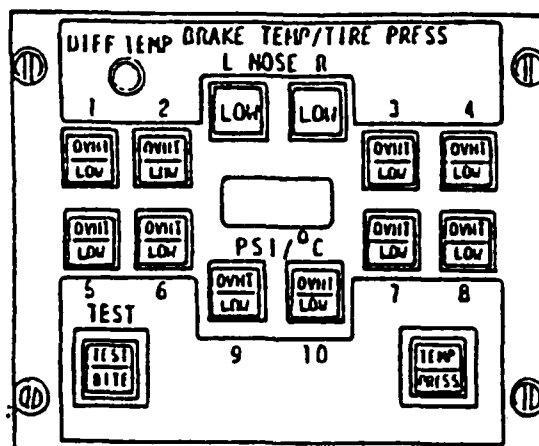
ENGINEER FOUND OK, PRESSURE = 200 PSI. DURING CLIMB-OUT, SYSTEM

"BITE" LIGHT ON IN PRESSURE MODE. WHEEL #2 DISPLAYS 496 PSI.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date MAY 15, 1980 Flight 175 Airport Code NCE

Outside Air Temp. 14°C Time of Day 1010

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.												

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

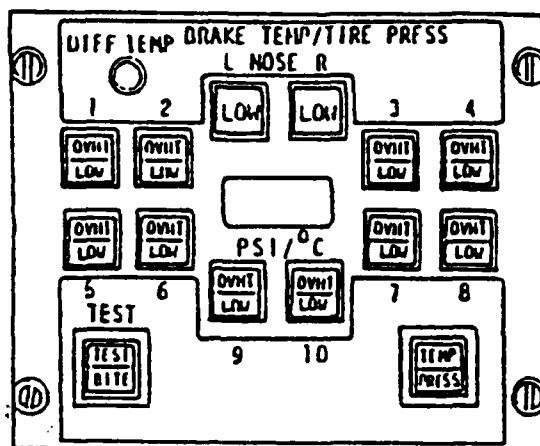
"BITE" LIGHT ON AFTER SWITCHING APII AT PARKING. NO DISPLAY.

NORMAL AFTER RESET C/B E-4.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date MAY 20, 1980 Flight 192 Airport Code BOM
Outside Air Temp. 30°C Time of Day 2300

Tire Pressures: DURING INITIAL CLIMB

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.		10										

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

DURING INITIAL CLIMB, WHEEL #1 AND #2 PRESSURE "LOW" LIGHTS

ON WITH A PRESSURE DISPLAY OF 10 PSI. LATER "BITE" LIGHT ON

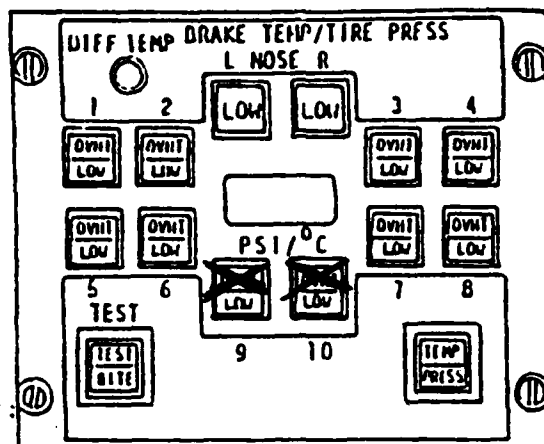
AND DISPLAY 000 PSI WHEN #2 LIGHT/SWITCH IS DEPRESSED.

(SHORTED SENSOR?)

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date AUGUST 20, 1980 Flight 174 Airport Code 4TH AIRBORNE IN FLIGHT

Outside Air Temp. 0°C Time of Day 1810

Tire Pressures: (PLEASE FILL IN PRESSURES FOR ALL WHEELS)

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	-	180	192	182	184	186	184	176	156	-	154	156

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	32	46	34	38	34	34	28	28	20	20

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

WHEEL #1 PRESSURE INDICATION IS WRONG. REPLACE WHEEL #1 WITHOUT

SUCCESS. AFTER 4 HOURS FLIGHT TIME, WHEEL #9 AND #10 "OVHT"

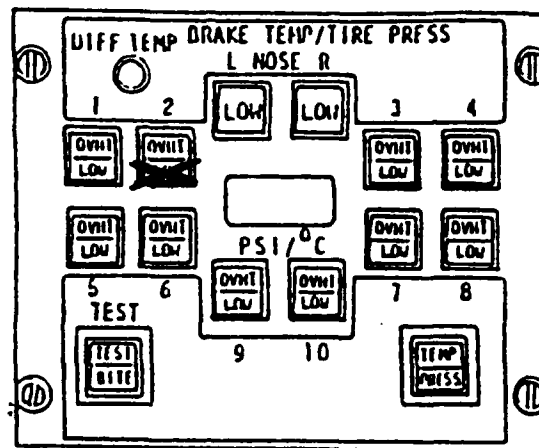
LIGHTS ON. NO TEST MODE POSSIBLE. WHOLE SYSTEM IS BLOCKED.

OK AFTER RESETTNG C/B B-12.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date SEPTEMBER 14, 1980 Flight 188 Airport Code SIN
Outside Air Temp. 13°C Time of Day 0940

Tire Pressures: DURING DESCENT.

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	178	100	188	182	176	192	190	172	156	158	154	156

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

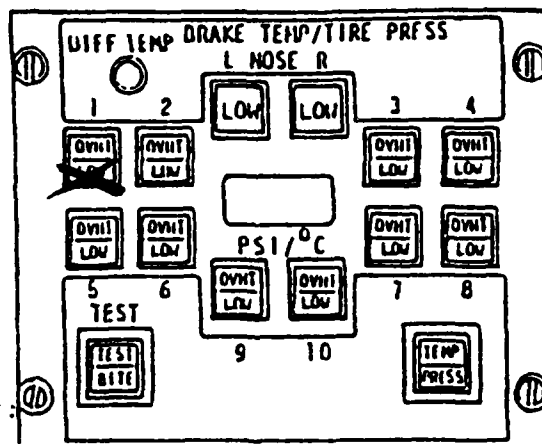
Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

ON GROUND PRESSURE READOUTS: #1 = 186, #2 = 186, #3 = 192,
#4 = 190, #5 = 176, #6 = 196, #7 = 190, #8 = 180, #9 = 158,
#10 = 162, NL = 154, NR = 156.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date DECEMBER 9, 1980 Flight 147 Airport Code DKR - GVA

Outside Air Temp. -55°C Time of Day CRUISE

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	164	194	178	188	176	186	190	186	154	160	*	*

* = DISABLED

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

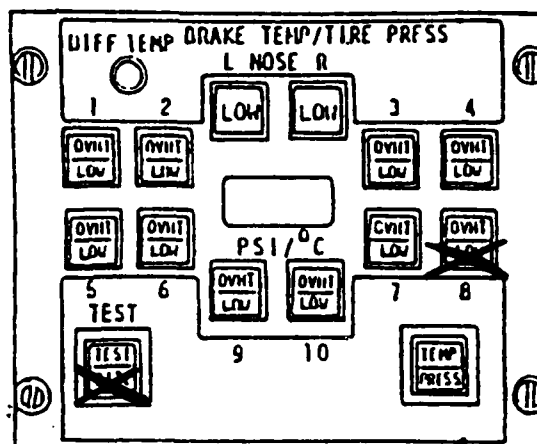
Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

"LOW" PRESSURE WARNING LIGHT ON DURING CRUISE AT WHEEL #1.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date DECEMBER 17, 1980 Flight 395 Airport Code AUH + DHA

Outside Air Temp. 26°C to 28°C Time of Day 1200

Tire Pressures: IN FLIGHT READINGS

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	-	208	186	-	-	198	202	000	170	180	-	-

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

ON GROUND DHA, "LOW" LIGHT #8 PLUS "BITE" LIGHT ON. PRESSURE

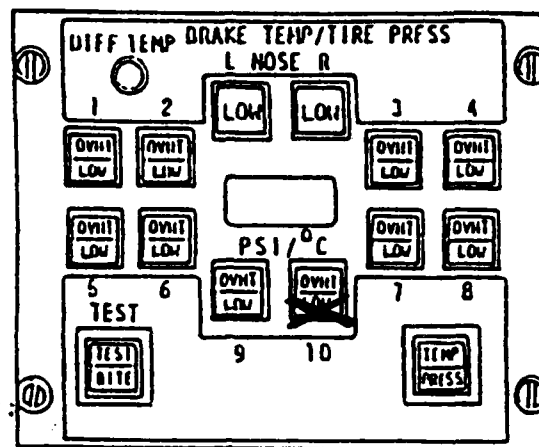
INDICATION FLUCTUATES BETWEEN 40 PSI AND 48 PSI. PRESSURE GAUGE

SHOWN 195 PSI. TEST NORMAL. IN FLIGHT DATA, SEE ABOVE.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date JANUARY 12, 1981 Flight 285 Airport Code FIH

Outside Air Temp. -4°C Time of Day 2345

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	-	218	184	-	-	208	214	-	230	184	-	-

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	86	98	72	82	98	120	78	86	78	80

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

"LOW" LIGHT WHEEL #10 ON AFTER TAKEOFF. "BITE" LIGHT ON AND

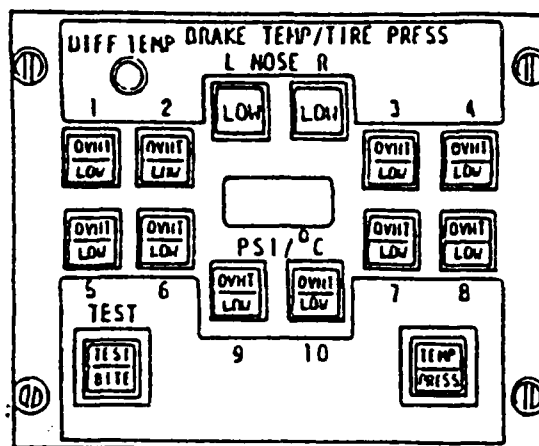
OFF. AFTER 4 HOURS FLIGHT TIME, "BITE" LIGHT STEADY ON.

(WHEEL #9 INDICATED 496) AND #10 "LOW" LIGHT OFF.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date JANUARY 29, 1980 Flight 176 Airport Code GVA

Outside Air Temp. -50°C Time of Day 1645

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	-	496	170	-	-	184	-	-	-	154	-	-

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	26	46	26	26	38	42	20	22	20	22

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFP.

DC-10 TIRE PRESSURE INDICATING SYSTEM
HB-IHB (FUS. #73)
GOODYEAR SYSTEM
COCKPIT AND MAINTENANCE COMPLAINT LOG

03/02/80 Cockpit Complaint: Depressing TEST/BITE switch, wheel #5 lamp did not come on. In addition, wheel #8 had only one OVHT light bulb on.

 Action/Comment: BTM/TPI cockpit display panel was repaired by electrical engineering.

03/02/80 Cockpit Complaint: After landing, BITE light came on.

 Action/Comment: Light disappeared after cycling circuit breaker B-12. It was suspected to be an electrical problem.

03/07/80 Cockpit Complaint: During push-back, TPI wheel #6 started fluctuating between 50 to 174 psi. In addition, wheel #6 LOW light was on. After push-back, wheel #6 indicated 60 psi with LOW light on. BITE light illuminated for one minute. During descent, BITE light came on again, but only in pressure mode. Indicator read 006 psi. This lasted till after landing. Ground check was normal. During next taxi and takeoff, indication was normal. But digital indicator read 14 psi during cruise. In addition, LOW light of wheel #6 was on. This provided a false warning.

 Action/Comment: Wheel cover #6 was correctly installed.

03/25/80 Cockpit Complaint: Wheel #1 LOW pressure warning light came on. Indicator read 164 psi.

 Action/Comment: Reset circuit breaker E-4 resumed normal system indication.

However, ground check did verify a necessity to adjust the tire pressure of wheel #1. After cycling circuit breaker, the low light disappeared possibly because of marginal low condition. It did provide a justified low tire.

03/30/80 Cockpit Complaint:

No digital display on brake temperature or tire pressure. Put system in TEST mode, display remained blank. In addition, temperature mode provided BITE light and OVHT lights on wheel #9 and wheel #10.

Action/Comment:

On ground, pressure mode indicated no discrepancy. However, temperature mode indicated "898" with wheels #9 and #10 OVHT lights on. Individual selection of each wheel showed normal temperature readout in all wheels except wheels #2 and #6. This same error repeated in the pressure mode. In air, both tire pressure and brake temperature were found normal. Removed the BTM/TPI cockpit display panel for repair. After reinstallation, everything was normal.

04/12/80 Cockpit Complaint:

One of the OVHT light bulbs of wheel #6 was out.

Action/Comment:

Replaced light bulb.

04/19/80 Cockpit Complaint:

After four hours flight time, wheel #1 LOW pressure warning light flickered twice. Wheel #1 read 162 psi and wheel #2 read 190 psi.

Action/Comment:

Tire pressure of wheel #1 was checked and corrected. This justified a low tire due to differential pressure between axle mates.

04/27/80 Cockpit Complaint:

During ground and flight mode,

BITE light came on. BITE light was blocked all the time. No success with cycling of circuit breaker E-4. After 5 hours flight time, BITE light went off. Due to worn tire condition, tires #3 and #4 had been changed at Zurich. Pressure indication on wheel #3 was only 8 psi. After landing, wheel #3 indicated normal again.

	Action/Comment.	None.
04/30/80	Cockpit Complaint:	One hour after takeoff, wheel #1 LOW pressure light came on. Pressure readout #1 = 190 psi, #2 = 222 psi, #5 = 206 psi and #6 = 228 psi. Temperature indication was 80°C to 90°C.
	Action/Comment:	Adjusted wheel #2 pressure to 180 psi. This provided a <u>justified low tire</u> due to differential pressure between axle mates.
05/08/80	Cockpit Complaint:	Mode select switch on brake temperature and tire pressure was interrupted.
	Action/Comment:	None.
05/10/80	Cockpit Complaint:	BITE light came on. Wheel #2 indicated 496°C in temperature mode.
	Action/Comment:	All wheels tire pressure checked manually and found normal. Brake temperature checked by hand was normal too.
05/11/80	Cockpit Complaint:	Wheel #2 pressure indicated 496 psi. In addition, wheel #1 LOW pressure light was on intermittently.
	Action/Comment:	Found wiring of TPI interrupted.
05/12/80	Cockpit Complaint:	During taxi - out, wheel #1 LOW pressure light came on. Pressure was 175 psi and temperature was

AD-A127 228

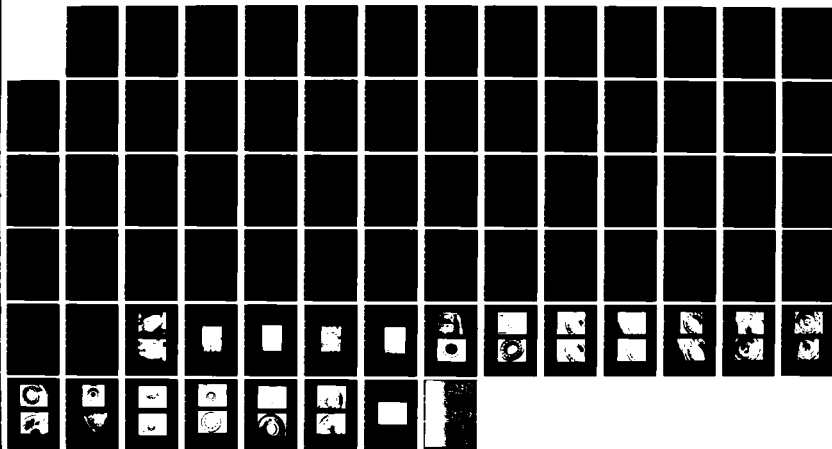
SERVICE EVALUATION OF AIRBORNE TIRE PRESSURE INDICATING
SYSTEMS(U) MCDONNELL DOUGLAS CORP LONG BEACH CA DOUGLAS
AIRCRAFT DIV W W KWONG DEC 82 DOT/FAR/CT-82/98
DTFA03-81-C-00044

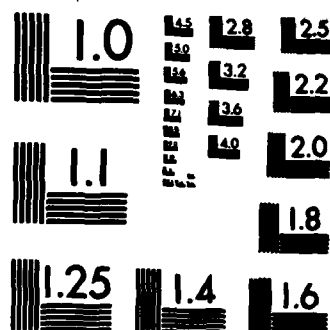
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

100°C. It averaged 25-30 psi lower than the other positions.

	Action/Comment:	Returned to ramp and checked by ground crew. Replaced wheel #1 because pressure transducer on wheel #1 caused low indication in cockpit. This provided a <u>false warning</u> .
05/12/80	Cockpit Complaint:	During climb-out, BITE light came on. Put system in pressure mode, wheel #2 indicated 496 psi. In addition, wheel #6 read 496 psi.
	Action/Comment:	Ground check on wheel #2 was normal. Replaced wheel #2 due to worn tire.
05/13/80	Cockpit/Complaint:	Tire pressure readout on wheel #4 was always 496 psi.
	Action/Comment:	None.
05/15/80	Cockpit Complaint:	During climb-out, BITE light came on. Put system in pressure mode, display indicated 496 psi. In addition, wheel #6 showed the same indication.
	Action/Comment:	Found antiskid wheel speed transducer connector plug broken. This caused system BITE light illumination. Replaced both plug and socket of wheels #2, #4 and #6. This proved the system <u>built-in-test capability</u> .
05/20/80	Cockpit Complaint:	During initial climb, wheel #2 LOW pressure warning light was on with 10 psi displayed. During cruise, BITE light came on. Put system in pressure mode. Depressed wheel #2 light/switch indicated 000 psi.
	Action/Comment:	Pressure check with hand-held gauge was ok. It was found that wheel #2 hubcap was shorted. Replaced #2 hubcap. This again proved the system <u>built-in-test</u>

capability.

05/22/80	Cockpit Complaint:	Mode-select switch was inoperative. System was still in operating mode.
	Action/Comment:	BTM/TPI cockpit display panel and computer were removed for repair and modification at Goodyear, in Akron. A normal BTMS was installed to monitor brake temperature status.
06/13/80	Cockpit Complaint:	Brake temperature of wheel #3 indicated 170 psi less than the highest indication of wheel #2. Wheel #2 read 200°C and wheel #3 read 30°C.
	Action/Comment:	No fault light indicated during BITE test performed on antiskid. Replaced antiskid control box. Checked and found normal.
06/13/80	Cockpit Complaint:	Brake temperature of wheel #3 remained as before; that is, 170°C lower than the highest indication provided by wheel #2.
	Action/Comment:	Antiskid wheel speed transducer connector plug was replaced. In the tire shop, a pressure transducer on one of the wheels was found abnormal. Rubber and shielding were broken on about half the cable circumference at cable/rubber cap transition of the pressure transducer. This was installed on the aircraft from 5/29/80 till 6/1/80. Reason for damage was unknown. Pressure transducer was handed over to Goodyear for investigation/repair on 6/25/80.
06/27/80	Cockpit Complaint:	Brake temperature of wheel #8 was low. Readout was only 30°C. Highest brake temperature was 80°C.
	Action/Comment:	Antiskid wheel speed transducer

connector plug was replaced (wire at the socket end was broken) by new type of matrix connector with cable clamp installed. Shop findings repeated the same failure. Rubber and shielding were broken the same way and in the same location as discovered on 6/13/80. This could be a vulcanizing problem. A total of four pressure transducers was damaged in the same way.

08/12/80	Action/Comment:	Reinstalled the modified BTM/TPI cockpit display panel and computer. Reactivated the system again.
08/12/80	Maintenance Complaint:	After reactivation of system, indication was 260 psi for wheel #10.
	Action/Comment:	By means of hand-held gauge, pressure was verified to be 155 psi. In addition, pressure transducer resistance was 1540 ohms instead of the normal readout of 679 ohms. Deactivate TPI wheel #10. Wheel would be replaced when spare pressure transducer was available. Removed the pressure transducer and could not duplicate the same failure in the shop.
08/14/80	Cockpit Complaint:	Wheel #9 steady LOW pressure warning indication. Display showed 164 psi which was approximately 30 psi lower than wheel #10 readout.
	Action/Comment:	Checked with hand-held tire pressure gauge was normal. Engineering comment was that the cockpit indication for wheel #10 was obviously too high again.
08/16/80	Maintenance Complaint:	Wheel #10 indication in cockpit was approximately 60 psi too high. Checked resistance between the pressure transducer (wheel #10)

and computer (located in the center accessory compartment). It was approximately 300 ohms too high. Resistance of the pressure transducer itself was within limit.

Action/Comment: Disabled TPI wheel #10. Replaced rotating conductor (this referred to the modified antiskid wheel speed transducer).

08/19/80 Cockpit Complaint: Wheel #1 LOW pressure warning, indicated 162 psi intermittently during cruise.

Action/Comment: Adjust tire pressure for wheel #1. Cockpit indication = 178 psi. Fill valve gauge = 190 psi.

08/19/80 Cockpit Complaint: Determined that wheel #1 pressure indication was wrong.

Action/Comment: Replaced wheel #1.

08/20/80 Cockpit Complaint: Wheel #1 tire pressure read 170 psi instead of 190 psi. Wheel replacement without success.

Action/Comment: Tire pressure transducer resistance was checked out from the system computer, but found within limit.

08/20/80 Cockpit Complaint: After four hours of flight time, wheels #9 and #10 OVHT lights came on. System test was impossible. Whole system operation was blocked.

Action/Comment: System resumed normal operation after resetting circuit breaker B-12.

09/03/80 Cockpit Complaint: Cockpit display panel readout:
#2 = 174 psi
#5 = 160 psi
#6 = 182 psi
Hand-held pressure gauge readout:
#2 = 175 psi
#5 = 175 psi
#6 = 175 psi

Action/Comment: Wheel #5 was checked and found within tolerance. Replaced wheel #1 rotating conductor (modified antiskid wheel speed transducer). It was found that the insulation resistance was only 6 kilo-ohms. Its value was supposedly infinite resistance.

09/07/80 Maintenance Complaint: Wheel #2 LOW pressure indication.

Action/Comment: Disabled wheel #2 TPI on the system computer.

09/07/80 Cockpit Complaint: After parking, DIFF TEMP light illuminated.

#1=110	#3=124
#2=115	#4=130
#5=108	#6=120
#7=200	
#8=120	

Action/Comment: Brakes #3, #7, #9 were bled.

09/14/80 Cockpit Complaint: During parking, wheel #2 LOW pressure warning light came on. Pressure indicated 114 psi.

Action/Comment: Checked outside. No comment.

09/14/80 Cockpit Complaint: After 40 minutes of ground time, normal tire pressure indicating again. During descent, wheel #2 went down to 60-100 psi. Wheel #2 LOW pressure warning light came on. On ground, indication was normal again.

Action/Comment: Disabled wheel #2 TPI on the system computer. Found in the shop that pressure transducer cable was broken, similar to the incidents that occurred on 6/13/80 and 6/27/80. The pressure transducer was returned to Goodyear for repair. This provided a false warning.

09/16/80 Cockpit Complaint: Digital display in the pressure mode indicated no illumination for

the center horizontal display of the last digit. After 6 hours, it went back to normal again.

	Action/Comment:	Ground check by maintenance was normal. In addition, shop findings revealed oversized pipe thread on the pressure transducer. This was due to wear to the extent where pressure transducer pipe thread bottomed out.
09/21/80	Cockpit Complaint:	During test and individual selection, digital display in the PRESSure mode indicated no illumination for the center horizontal display of the last digit.
	Action/Comment:	Checked on ground, found normal.
10/04/80	Cockpit Complaint:	Digital display presented no indication on the center line of first digit.
	Action/Comment:	Repaired.
10/25/80	Cockpit Complaint:	TPI showed 668 in test mode instead of 888.
	Action/Comment:	Repaired.
10/25/80	Cockpit Complaint:	Wheel #10 LOW pressure light blinked on and off during taxi. Pressure readouts were normal.
	Action/Comment:	Ground check was normal. Again, this presented a <u>false warning</u> .
10/27/80	Cockpit Complaint:	Test mode showed 868 instead of 888.
	Action/Comment:	Replaced 2 light bulbs.
10/27/80	Cockpit Complaint:	Wheel #10 LOW pressure warning light came on during approach, pressure indicated 160 psi. All normal on ground again.
	Action/Comment:	Ground check was normal. No

failure was found. It was a false warning.

10/28/80 Cockpit Complaint: Wheel #10 LOW pressure warning light was on during cruise. System was normal again moments later.

Action/Comment: Ground check was normal again.

11/01/80 Cockpit Complaint: Digital display indicated partial illumination of the first digit. Put system in test mode, showed 688.

Action/Comment: Ground maintenance check was normal.

11/06/80 Cockpit Complaint: Digital display read 680 instead of 888 during test.

Action/Comment: Ground check was OK.

11/06/80 Cockpit Complaint: Wheel #10 LOW pressure warning light illuminated. Pressure indication was 154 psi.

Action/Comment: Performed functional check, but found system normal.

11/10/80 Maintenance Complaint: Wheel #3 indicated pressure value of 170 psi which is at its minimum nominal pressure.

Action/Comment: Ground check on inflation pressure on wheel #3 was normal.

11/10/80 Cockpit Complaint: Tire pressure readout was not able to be read. All digits were disturbed.

Action/Comment: Replaced 5 display lamps.

11/11/80 Cockpit Complaint: Wheel #3 LOW pressure warning light was on. Pressure indication was 162 psi. After landing, normal indication again.

Action/Comment: By hand-held tire pressure gauge, wheel #3 was found normal. This

presented a false warning.

11/18/80 Cockpit Complaint: Wheel #6 LOW pressure warning light flickered during taxi. Pressure readout for wheel #5 fluctuated between 170-200 psi while wheel #6 showed 180 psi.

Action/Comment: Tire pressure was checked, but found normal. This considered a false warning.

11/24/80 Cockpit Complaint: TEMP portion in the mode-select light/switch was inoperable.

Action/Comment: Changed 2 light bulbs.

11/26/80 Cockpit Complaint: During taxi, "bang" from main landing gear was audible. Few seconds later, wheel #1 LOW pressure warning light came on.

Action/Comment: Main wheel #1 was deflated by the wheel chock. Replaced wheels #1 and #2. This justified a low tire detection.

11/28/80 Cockpit Complaint: Wheel #3 LOW pressure warning light came on during the last hour of flight. Pressure indicated 164 psi. After landing, system was normal again.

Action/Comment: Ground check was normal. It was a false warning.

11/29/80 Maintenance Complaint: Installed nose landing gear TPI hardware but found unreliable.

Action/Comment: Action was stopped with both nose wheel TPI disabled on the system computer.

11/30/80 Cockpit Complaint: Third digit of the digital display was only partially illuminated.

Action/Comment: Repaired by shop. Also, wheel #4 TPI was disabled because of high indication. It was decided that the rotating conductor (modified

antiskid wheel speed transducer)
was to be replaced.

12/03/80 Cockpit Complaint: Digital display showed 889 in test instead of 888.

Action/Comment: Display lamp was replaced.

12/07/80 Cockpit Complaint: PRESS portion of the mode-select switch was inoperative.

Action/Comment: Replaced light bulbs.

12/07/80 Cockpit Complaint: Wheel #1 tire pressure indicated 164 psi.

Action/Comment: Tire pressure was checked with hand-held tire pressure gauge. Indication was 180 psi. Cockpit display panel was apparently providing erratic readout.

12/09/80 Cockpit Complaint: First digit of the digital display was only partially illuminated.

Action/Comment: Repaired.

12/09/80 Cockpit Complaint: Wheel #1 LOW pressure warning light was on. Pressure indicated 164 psi.

Action/Comment: Pressure check was found to be 178 psi. It provided a false warning.

12/16/80 Cockpit Complaint: Last digit of the digital display was only partially illuminated. After knocking on the indicator, system resumed normal.

Action/Comment: Ground check was normal.

12/16/80 Cockpit Complaint: Wheel #8 TPI indication fluctuated between 20 psi and 400 psi during taxi out. After stop, wheel #8 LOW pressure warning light was on. Later time, display was normal again. Indication was 172 psi. After takeoff and during cruise flight, pressure displayed 22 psi for wheel #8 with LOW pressure

warning light. In addition, BITE light came on.

Action/Comment: None.

12/17/80 Cockpit Complaint: Wheel #8 LOW pressure warning light remained on. Also BITE light was illuminated. Pressure indication fluctuated from 0 psi to 42 psi. Put system in test mode and found no failure indication.

Action/Comment: Ground check on pressure showed 195 psi. Wheel #8 TPI was then disabled on the system computer.

12/23/80 Cockpit Complaint: First digit of the digital display was only partially illuminated.

Action/Comment: No spare light bulbs available for repair.

12/24/80 Cockpit Complaint: Test showed 286 (blinking) instead of 888.

Action/Comment: No spare light bulbs available for repair.

12/31/80 Cockpit Complaint: After knocking of the indicator, normal test indication "888" again.

Action/Comment: None.

01/02/81 Cockpit Complaint: Indicator again was not completely illuminated.

Action/Comment: None.

01/03/81 Cockpit Complaint: First digit of the digital display was only partially illuminated.

Action/Comment: Replaced 6 light bulbs.

01/03/81 Cockpit Complaint: Second digit of the digital display showed only "9" instead of "8," partially illuminated.

Action/Comment: Replaced light bulbs.

01/08/81	Cockpit Complaint:	Second digit of the digital display was only partially illuminated.
	Action/Comment:	Replaced light bulbs.
01/08/81	Cockpit Complaint:	On ground, BITE light illuminated in the pressure mode.
	Action/Comment:	Ground check was normal.
01/12/81	Cockpit Complaint:	Third digit of the digital display was only partially illuminated.
	Action/Comment:	Replaced light bulbs.
01/12/81	Cockpit Complaint	After takeoff, wheel #10 LOW pressure warning light came on. Pressure indicated 184 psi. In addition, BITE light came on and off. After 4 hours of flight time, BITE light remained steady on. Wheel #9 pressure indicated 496 psi. Wheel #10 LOW pressure warning light went off.
	Action/Comment:	Disabled TPI wheel #9 on system computer.
01/29/81	Cockpit Complaint:	BITE light illuminated 3 hours after takeoff. Wheel #2 pressure indicated 496 psi.
	Action/Comment:	Wheel #2 TPI was disabled on the system computer.
01/30/81	Cockpit Complaint:	First digit of the digital display was only partially illuminated.
	Action/Comment:	Replaced light bulbs.
02/02/81	Cockpit Complaint:	Second digit of the digital display was only partially illuminated.
	Action/Comment:	Replaced light bulbs.
02/04/81	The Goodyear BTM/TPI system was removed from service. This completed the in-service test evaluation.	

APPENDIX B

FAIRCHILD SYSTEM IN-SERVICE EVALUATION DATA

APPENDIX B

DC-10 TIRE PRESSURE INDICATING SYSTEM HB-IHA (FUS. #57) FAIRCHILD SYSTEM TIRE PRESSURE ACCURACY READOUT

DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)												NL	NR
			1	2	3	4	5	6	7	8	9	10				
03/29/80	20°	GAUGE (C)	181	179	179	179	181	179	181	179	158	158	186	188		
		COCKPIT	181	178	178	178	180	177	180	178	156	155	184	186		
		DELTA	0	-1	-1	-1	-1	-2	-1	-1	-2	-3	-2	-2		
04/01/80	20°	GAUGE (N)	180	176	175	176	180	176	177	176	156	151	184	185		
		COCKPIT	178	174	174	173	177	174	176	173	153	149	183	184		
		DELTA	-2	-2	-1	-3	-3	-2	-1	-3	-3	-2	-1	-1		
04/03/80	20°	GAUGE (N)	172	172	174	172	172	172	172	171	152	149	176	179		
		COCKPIT	174	173	174	173	175	172	175	172	152	149	177	178		
		DELTA	+2	+1	0	+1	+3	0	+3	+1	0	0	+1	-1		
04/05/80	18°	GAUGE (N)	178	178	174	179	174	176	175	175	151	148	185	182		
		COCKPIT	171	171	170	174	171	171	171	171	150	146	185	179		
		DELTA	-7	-7	-4	-5	-3	-5	-4	-4	-1	-2	0	-3		
04/06/80	18°	GAUGE (N)	178	178	179	183	178	178	178	179	156	155	186	182		
		COCKPIT	176	175	177	177	176	176	178	178	154	154	183	183		
		DELTA	-2	-3	-2	-6	-2	-2	0	-1	-2	-1	-3	+1		
04/08/80	5°	GAUGE (N)	170	170	170	172	170	170	170	170	150	148	188	180		
		COCKPIT	170	170	167	171	170	169	167	168	148	144	184	178		
		DELTA	0	0	-3	-1	0	-1	-3	-2	-2	-4	-4	-2		
04/09/80	18°	GAUGE (C)	181	183	184	183	183	183	184	183	161	161	197	187		
		COCKPIT	182	182	182	183	183	182	185	184	159	159	194	186		
		DELTA	+1	0	-2	0	0	-1	+1	+1	-2	-2	-3	-1		
04/10/80	18°	GAUGE (C)	179	179	181	180	180	180	181	182	156	156	186	186		
		COCKPIT	178	179	179	181	179	180	181	182	155	155	185	185		
		DELTA	-1	0	-2	+1	-1	0	0	0	-1	-1	-1	-1		
04/12/80	8°	GAUGE (N)	181	179	179	178	182	179	179	178	154	153	175	179		
		COCKPIT	183	179	177	177	183	178	180	178	155	151	171	179		
		DELTA	+2	0	-2	-1	+1	-1	+1	0	+1	-2	-4	0		
04/14/80	27°	GAUGE (N)	183	185	185	185	185	185	185	185	159	158	189	196		
		COCKPIT	183	182	183	184	184	183	185	185	160	158	189	196		
		DELTA	0	-3	-2	-1	-1	-2	0	0	+1	0	0	0		
04/15/80	13°	GAUGE (C)	184	186	184	174	187	186	184	184	161	159	193	191		
		COCKPIT	182	185	184	172	188	184	187	184	161	157	191	192		
		DELTA	-2	-1	0	-2	+1	-2	+3	0	0	-2	-2	+1		

C = DATA PROVIDED BY CALIBRATED HAND-HELD GAUGE, ± 2 PSI

N = DATA PROVIDED BY NONCALIBRATED HAND-HELD GAUGE, ± 4 PSI

C* = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)											
			1	2	3	4	5	6	7	8	9	10	NL	NR
04/19/80	80	GAUGE (N)	179	178	179	179	179	181	181	185	158	156	185	186
		COCKPIT	176	177	176	179	178	178	179	181	153	151	179	184
		DELTA	-3	-1	-3	0	-1	-3	-2	-4	-5	-5	-6	-2
04/26/80	80	GAUGE (N)	176	182	176	175	179	188	176	179	154	149	186	186
		COCKPIT	176	184	175	174	177	188	177	178	153	146	183	186
		DELTA	0	+2	-1	-1	-2	0	+1	-1	-1	-3	-3	0
04/27/80	90	GAUGE (C)	174	174	178	171	175	174	178	178	155	150	187	181
		COCKPIT	174	174	176	170	176	172	178	178	154	146	183	180
		DELTA	0	0	-2	-1	+1	-2	0	0	-1	-4	-4	-1
04/29/80	120	GAUGE (C)	184	184	182	182	181	177	189	188	161	155	188	188
		COCKPIT	184	184	182	178	183	179	190	187	161	157	186	182
		DELTA	0	0	0	-4	+2	+2	+1	-1	0	+2	+2	-6
05/02/80	250	GAUGE (N)	180	178	185	170	180	180	178	178	158	155	200	182
		COCKPIT	178	176	183	169	179	180	179	175	154	153	194	179
		DELTA	-2	-2	-2	-1	-1	0	+1	-3	-4	-2	-6	-3
05/04/80	170	GAUGE (N)	182	180	176	180	184	171	178	168	149	152	177	176
		COCKPIT	183	180	175	185	187	170	180	167	150	152	177	175
		DELTA	+1	0	-1	+5	+3	-1	+2	-1	+1	0	0	-1
05/06/80	100	GAUGE (C)	174	174	174	178	177	174	174	171	145	151	181	184
		COCKPIT	175	174	174	179	176	173	178	172	145	149	180	183
		DELTA	+1	0	0	+1	-1	-1	+4	+1	0	-2	-1	-1
05/10/80	110	GAUGE (N)	172	172	184	187	173	173	185	187	158	150	185	185
		COCKPIT	171	171	183	187	171	171	185	185	153	148	180	183
		DELTA	-1	-1	-1	0	-2	-2	0	-2	-5	-2	-5	-2
05/11/80	170	GAUGE (C)	181	177	195	178	181	178	195	189	165	145	185	188
		COCKPIT	182	178	196	185	183	176	199	192	168	155	184	186
		DELTA	+1	+1	+1	+7	+2	-2	+4	+3	+3	+10	-1	-2
05/13/80	180	GAUGE (C)	180	180	185	172	180	179	182	185	160	155	185	185
		COCKPIT	179	178	183	170	181	177	185	184	160	153	185	184
		DELTA	-1	-2	-2	-2	+1	-2	+3	-1	0	-2	0	-1
05/14/80	140	GAUGE (N)	180	180	183	173	180	178	181	182	160	167	182	183
		COCKPIT	177	176	181	171	178	174	182	178	156	165	178	180
		DELTA	-3	-4	-2	-2	-2	-4	+1	-4	-4	-2	-4	-3
05/17/80	160	GAUGE (C)	180	180	185	185	181	177	187	185	161	169	181	181
		COCKPIT	180	177	183	182	182	176	186	184	162	169	178	180
		DELTA	0	-3	-2	-3	+1	-1	-1	-1	+1	0	-3	-1

C = DATA PROVIDED BY CALIBRATED HAND-HELD GAUGE, ± 2 PSI

N = DATA PROVIDED BY NONCALIBRATED HAND-HELD GAUGE, ± 4 PSI

C* = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

DATE	OUTSIDE AIR TEMP (°C)	TIRE PRESSURE READOUT (PSI)											
			1	2	3	4	5	6	7	8	9	10	NL NR
05/19/80	18°	GAUGE (C)	181	181	188	181	181	181	188	188	161	171	195 195
		COCKPIT	182	180	187	181	182	179	180	186	162	172	197 196
		DELTA	+1	-1	-1	0	+1	-2	-8	-2	+1	+1	+2 +1
05/20/80	18°	GAUGE (N)	179	179	186	182	181	179	188	186	164	169	195 195
		COCKPIT	178	177	184	179	179	176	187	184	160	168	192 192
		DELTA	-1	-2	-2	-3	-2	-3	-1	-2	-4	-1	-3 -3
05/22/80	15°	GAUGE (C)	175	175	182	178	178	175	182	182	160	165	192 190
		COCKPIT	175	175	182	176	178	173	184	181	160	162	189 188
		DELTA	0	0	0	-2	0	-2	+2	-1	0	-3	-3 -2
05/23/80	21°	GAUGE (C)	186	184	185	181	186	184	187	184	161	162	195 190
		COCKPIT	186	184	185	182	185	183	185	183	161	162	192 187
		DELTA	0	0	0	+1	-1	-1	-2	-1	0	0	-3 -3
05/25/80	18°	GAUGE (C)	193	193	196	196	190	193	198	196	168	175	195 190
		COCKPIT	194	192	196	198	192	191	200	197	170	178	195 191
		DELTA	+1	-1	0	+2	+2	-2	+2	+1	+2	+3	0 +1
05/27/80	18°	GAUGE (C)	189	186	183	181	189	185	186	181	162	163	195 189
		COCKPIT	185	184	183	178	186	185	186	183	159	162	192 187
		DELTA	-4	-2	0	-3	-3	0	0	+2	-3	-1	-3 -2
05/28/80	(HANGAR)	GAUGE (C*)	173	180	181	177	172	181	182	180	157	160	190 182
		COCKPIT	172	180	181	176	172	181	184	180	156	159	189 181
		DELTA	-1	0	0	-1	0	0	+2	-0	-1	-1	-1 -1
05/30/80	22°	GAUGE (C)	172	180	182	188	171	182	182	182	156	161	192 185
		COCKPIT	171	179	181	183	171	180	183	181	155	157	193 183
		DELTA	-1	-1	-1	-5	0	-2	+1	-1	-1	-4	+1 -2
05/31/80	16°	GAUGE (N)	182	188	189	185	181	188	192	188	165	168	193 192
		COCKPIT	179	185	189	179	177	184	193	185	162	164	190 188
		DELTA	-3	-3	0	-6	-4	-4	+1	-3	-3	-4	-3 -4
06/04/80	18°	GAUGE (N)	179	185	189	182	178	186	191	188	162	163	182 186
		COCKPIT	177	183	187	180	177	184	192	185	162	163	180 183
		DELTA	-2	-2	-2	-2	-1	-2	+1	-3	0	0	-2 -3
06/07/80	15°	GAUGE (C)	177	181	187	180	175	185	189	183	161	161	180 185
		COCKPIT	177	181	187	179	176	185	191	183	160	160	180 186
		DELTA	0	0	0	-1	+1	0	+2	0	-1	-1	0 +1
06/08/80	20°	GAUGE (N)	190	191	196	195	188	197	200	195	172	172	187 191
		COCKPIT	189	189	193	193	187	193	201	192	175	173	182 191
		DELTA	-1	-2	-3	-2	-1	-4	-1	-3	+3	+1	-5 0

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N = DATA PROVIDED BY NONCALIBRATED HAND-HELD GAUGE, ± 4 PSI

C* = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)												
DATE			1	2	3	4	5	6	7	8	9	10	ML	NR
06/13/80	200	GAUGE (N)	179	179	181	179	177	184	181	187	155	159	197	197
		COCKPIT	175	177	181	176	175	184	187	179	161	162	191	192
		DELTA	-4	-2	0	-3	-2	0	+6	-8	+6	+3	-6	-5
06/16/80	200	GAGUE (N)	180	182	185	176	178	195	181	180	165	165	182	185
		COCKPIT	182	183	183	174	180	194	182	178	165	164	182	183
		DELTA	+2	+1	-2	-2	+2	-1	+1	-2	0	-1	0	-2
06/19/80	210	GAUGE (N)	185	186	183	188	183	195	191	192	171	171	179	186
		COCKPIT	179	182	175	184	177	191	188	186	165	170	?	179
		DELTA	-6	-4	-8	-4	-6	-4	-3	-6	-6	-1	?	-7
06/22/80	160	GAUGE (C)	174	177	173	167	171	181	178	180	160	160	180	180
		COCKPIT	172	176	171	165	170	182	180	179	159	161	177	177
		DELTA	-2	-1	-2	-2	-1	+1	+2	-1	-1	+1	-3	-3
06/24/80	190	GAUGE (C)	173	171	167	180	171	172	170	168	167	154	--	--
		COCKPIT	169	170	164	177	170	171	170	165	163	150	--	--
		DELTA	-4	-1	-3	-3	-1	-1	0	-3	-4	-4	--	--
06/26/80	200	GAUGE (C)	180	183	184	189	181	185	181	181	165	160	181	181
		COCKPIT	180	182	182	187	182	185	183	180	162	160	180	181
		DELTA	0	-1	-2	-2	+1	0	+2	-1	-3	0	-1	0
06/26/80	(HANGAR)	GAUGE (C*)	179	181	182	185	180	182	180	179	162	157	180	181
		COCKPIT	179	181	181	185	181	183	182	179	162	159	178	180
		DELTA	0	0	-1	0	+1	+1	+2	0	0	+2	-2	-1
07/02/80	90	GAUGE (C)	187	181	180	179	181	180	180	180	152	153	194	196
		COCKPIT	186	182	179	179	179	177	180	179	153	153	185	191
		DELTA	-1	+1	-1	0	-2	-3	0	-1	+1	0	-9	-5
07/05/80	180	GAUGE (N)	190	200	200	190	200	200	190	200	165	170	190	190
		COCKPIT	192	200	193	191	198	200	195	196	169	170	195	200
		DELTA	+2	0	-7	+1	-2	0	+5	-4	+4	0	+5	+10
07/07/80	180	GAUGE (N)	176	189	185	182	179	185	183	183	158	158	191	196
		COCKPIT	178	190	186	181	183	187	187	184	160	161	189	197
		DELTA	+2	+1	+1	-1	+4	+2	+4	+1	+2	+3	-2	+1
07/08/80	220	GAUGE (N)	170	185	185	180	175	180	180	185	160	160	190	190
		COCKPIT	168	182	180	176	174	178	181	180	155	155	182	190
		DELTA	-2	-3	-5	-4	-1	-2	+1	-5	-5	-5	-8	0
07/11/80	150	GAUGE (N)	188	190	188	197	186	184	185	185	160	160	194	193
		COCKPIT	186	187	184	191	183	182	184	182	159	158	191	190
		DELTA	-2	-3	-4	-6	-3	-2	-1	-3	-1	-2	-3	-3

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C* = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)											
			1	2	3	4	5	6	7	8	9	10	NL	NR
07/13/80	20°	GAUGE (C)	189	193	187	188	187	187	184	187	161	163	191	190
		COCKPIT	190	192	185	187	187	187	186	185	160	159	188	188
		DELTA	+1	-1	-2	-1	0	0	+2	-2	-1	-4	-3	-2
07/16/80	15°	GAUGE (N)	186	178	188	190	182	182	186	190	161	155	183	188
		COCKPIT	183	173	184	186	182	182	185	186	159	153	181	184
		DELTA	-3	-5	-4	-4	0	0	-1	-4	-2	-2	-2	-4
07/18/80	15°	GAUGE (N)	181	169	184	181	177	175	178	174	154	149	174	175
		COCKPIT	178	168	181	178	176	172	177	172	152	145	169	174
		DELTA	-3	-1	-3	-3	-1	-3	-1	-2	-2	-4	-5	-1
07/20/80	18°	GAUGE (N)	187	181	181	187	184	184	184	179	164	171	197	199
		COCKPIT	188	182	179	184	184	186	184	176	162	170	195	197
		DELTA	+1	+1	-2	-3	0	+2	0	-3	-2	-1	-2	-2
07/22/80	14°	GAUGE (N)	184	179	177	182	182	180	180	175	158	164	187	194
		COCKPIT	188	181	178	183	184	183	184	175	160	166	187	194
		DELTA	+4	+2	+1	+1	+2	+3	+4	0	+2	+2	0	0
07/25/80	21°	GAUGE (N)	183	181	181	180	182	181	183	180	156	156	191	192
		COCKPIT	182	181	179	181	181	181	185	179	156	157	192	194
		DELTA	-1	0	-2	+1	-1	0	+2	-1	0	+1	+1	+2
07/27/80	21°	GAUGE (N)	188	186	189	188	186	178	185	186	162	164	198	193
		COCKPIT	190	187	190	188	188	177	187	187	162	164	199	195
		DELTA	+2	+1	+1	0	+2	-1	+2	+1	0	0	+1	+2
07/29/80	31°	GAUGE (N)	198	193	192	195	189	186	189	193	168	169	206	203
		COCKPIT	195	190	188	192	186	182	186	190	164	167	202	199
		DELTA	-3	-3	-4	-3	-3	-4	-3	-3	-4	-2	-4	-4
07/31/80	30°	GAUGE (N)	189	198	192	198	186	190	188	196	167	173	198	195
		COCKPIT	188	195	191	201	187	190	190	195	167	177	196	193
		DELTA	-1	-3	-1	+3	+1	0	+2	-1	0	+4	-2	-2
08/02/80	17°	GAUGE (N)	182	182	178	182	182	182	182	179	151	151	188	189
		COCKPIT	178	179	174	177	176	175	181	175	155	152	183	183
		DELTA	-4	-3	-4	-5	-6	-7	-1	-4	+4	+1	-5	-6
08/03/80	29°	GAUGE (N)	199	199	199	199	199	199	199	198	171	176	202	199
		COCKPIT	199	197	195	199	199	197	201	194	176	177	197	196
		DELTA	0	-2	-4	0	0	-2	+2	-4	+5	+1	-5	-3
08/07/80	19°	GAUGE (N)	173	177	172	176	173	173	176	172	146	152	179	180
		COCKPIT	174	177	171	174	173	172	177	171	145	149	178	179
		DELTA	+1	0	-1	-2	0	-1	+1	-1	-1	-3	-1	-1

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DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)											
			1	2	3	4	5	6	7	8	9	10	NL	NR
08/07/80	24°	GAUGE (C*)	181	182	180	182	181	180	181	181	154	156	193	193
		COCKPIT	181	181	178	179	180	179	182	179	153	153	192	191
		DELTA	0	-1	-2	-3	-1	-1	+1	-2	-1	-3	-1	-2
08/11/80	25°	GAUGE (N)	185	189	189	192	189	189	192	189	164	164	195	199
		COCKPIT	186	187	188	191	187	187	194	186	163	164	193	198
		DELTA	+1	-2	-1	-1	-2	-2	+2	-3	-1	0	-2	-1
08/14/80	16°	GAUGE (C)	176	177	176	183	177	176	177	174	152	153	183	187
		COCKPIT	177	178	174	181	176	176	178	171	149	149	182	186
		DELTA	+1	+1	-2	-2	-1	0	+1	-3	-3	-4	-1	-1
08/16/80	20°	GAUGE (C)	186	186	181	179	186	186	183	177	157	157	187	191
		COCKPIT	187	186	182	176	187	185	186	176	157	155	186	190
		DELTA	+1	0	+1	-3	+1	-1	+3	-1	0	-2	-1	-1
08/19/80	22°	GAUGE (N)	186	189	184	178	189	189	188	178	162	162	190	190
		COCKPIT	183	188	184	178	185	188	185	178	159	160	190	190
		DELTA	-3	-1	0	0	-4	-1	-3	0	-3	-2	0	0
08/21/80	22°	GAUGE (N)	185	188	182	176	188	188	183	188	156	156	179	191
		COCKPIT	188	189	183	178	190	192	188	187	162	161	180	190
		DELTA	+3	+1	+1	+2	+2	+4	+5	-1	+6	+5	+1	-1
08/23/80	21°	GAUGE (C)	179	187	179	174	179	181	181	176	153	154	189	187
		COCKPIT	179	186	177	172	178	180	182	176	154	154	187	186
		DELTA	0	-1	-2	-2	-1	-1	+1	0	+1	0	-2	-1
08/27/80	22°	GAUGE (N)	188	188	193	183	188	192	186	183	162	162	188	189
		COCKPIT	189	187	191	181	189	191	187	182	162	163	189	187
		DELTA	+1	-1	-2	-2	+1	-1	+1	-1	0	+1	+1	-2
08/29/80	22°	GAUGE (N)	181	180	180	171	189	188	180	173	152	156	182	187
		COCKPIT	182	179	180	170	188	188	180	172	154	154	182	185
		DELTA	+1	-1	0	-1	-1	0	0	-1	+2	-2	0	-2
08/30/80	20°	GAUGE (N)	182	180	182	182	180	180	182	190	155	162	182	200
		COCKPIT	182	178	181	180	181	179	182	187	153	161	182	203
		DELTA	0	-2	-1	-2	+1	-1	0	-3	-2	-1	0	+3
09/03/80	23°	GAUGE (N)	188	179	180	180	180	178	189	180	155	158	190	190
		COCKPIT	188	179	181	179	180	178	192	179	156	160	189	191
		DELTA	0	0	+1	-1	0	0	+3	-1	+1	+2	-1	+1
09/04/80	18°	GAUGE (C)	188	185	189	189	188	185	195	188	159	168	191	192
		COCKPIT	189	184	189	188	185	184	197	187	164	170	189	191
		DELTA	+1	-1	0	-1	-3	-1	+2	-1	+5	+2	-2	-1

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DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)											
			1	2	3	4	5	6	7	8	9	10	NL	NR
09/07/80	16°	GAUGE (N)	170	172	172	172	--	170	173	170	145	152	175	175
		COCKPIT	171	175	175	173	--	172	177	172	150	153	175	178
		DELTA	+1	+3	+3	+1	--	+2	+4	+2	+5	+1	0	+3
09/11/80	16°	GAUGE (C)	186	187	186	187	189	190	187	186	167	167	193	186
		COCKPIT	183	185	183	183	186	188	185	182	164	162	190	182
		DELTA	-3	-2	-3	-4	-3	-2	-2	-4	-3	-5	-3	-4
09/13/80	20°	GAUGE (C)	190	191	190	190	191	194	191	189	172	172	194	176
		COCKPIT	188	190	189	188	191	193	191	187	171	171	192	175
		DELTA	-2	-1	-1	-2	0	-1	0	-2	-1	-1	-2	-1
09/14/80	22°	GAUGE (C)	193	196	199	203	189	203	199	202	182	183	186	189
		COCKPIT	195	197	201	205	190	203	201	202	185	192	183	187
		DELTA	+2	+1	+2	+2	+1	0	+2	0	+3	+9	-3	-2
09/17/80	20°	GAUGE (C)	198	198	199	200	188	198	200	199	176	178	178	183
		COCKPIT	197	195	199	198	188	197	202	197	180	180	176	182
		DELTA	-1	-3	0	-2	0	-1	+2	-2	+4	+2	-2	-1
09/19/80	17°	GAUGE (C)	189	190	189	190	179	192	189	189	165	171	181	179
		COCKPIT	189	190	189	189	180	191	191	189	164	172	187	178
		DELTA	0	0	0	-1	+1	-1	+2	0	-1	+1	-1	-1
09/20/80	16°	GAUGE (C)	199	201	193	192	188	203	193	196	169	179	192	199
		COCKPIT	195	197	188	186	185	199	190	190	162	175	185	192
		DELTA	-4	-4	-5	-6	-3	-4	-3	-6	-7	-4	-7	-7
09/22/80	23°	GAUGE (C)	192	193	192	188	182	195	192	195	163	176	183	186
		COCKPIT	189	190	189	182	181	191	192	191	159	172	181	182
		DELTA	-3	-3	-3	-6	-1	-4	0	-4	-4	-4	-2	-4
09/23/80	17°	GAUGE (C)	185	192	192	181	178	192	192	192	156	171	182	182
		COCKPIT	183	188	186	175	174	189	188	186	154	168	175	176
		DELTA	-2	-4	-6	-6	-4	-3	-4	-6	-2	-3	-7	-6
09/24/80	13°	GAUGE (C)	181	185	183	176	171	185	185	185	155	166	182	181
		COCKPIT	178	183	181	171	168	182	182	181	150	162	179	178
		DELTA	-3	-2	-2	-5	-3	-3	-3	-4	-5	-4	-3	-3
09/27/80	14°	GAUGE (C)	184	181	186	176	177	189	186	181	156	169	179	180
		COCKPIT	187	183	187	177	180	191	189	183	158	174	178	178
		DELTA	+3	+2	+1	+1	+3	+2	+3	+2	+2	+5	-1	-2
10/01/80	20°	GAUGE (C*)	179	173	197	173	168	182	182	177	152	160	174	176
		COCKPIT	178	173	198	171	169	182	183	177	152	160	174	174
		DELTA	-1	0	+1	-2	+1	0	+1	0	0	0	0	-2

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DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)												NL	NR
			1	2	3	4	5	6	7	8	9	10				
10/05/80	17°	GAUGE (C)	176	175	175	176	179	182	176	171	146	153	182	182		
		COCKPIT	177	173	178	178	179	181	180	174	149	157	180	179		
		DELTA	+1	-2	+3	+2	0	-1	+4	+3	+3	+4	-2	-3		
10/05/80	27°	GAUGE (N)	182	176	188	186	182	185	186	182	152	161	192	193		
		COCKPIT	182	178	188	185	183	188	190	182	154	165	193	193		
		DELTA	0	+2	0	-1	+1	+3	+4	0	+2	+4	+1	0		
10/06/80	18°	GAUGE (N)	186	180	188	190	185	190	188	182	158	162	190	190		
		COCKPIT	182	175	185	183	183	184	187	179	153	158	186	186		
		DELTA	-4	-5	-3	-7	-2	-6	-1	-3	-5	-4	-4	-4		
10/08/80	9°	GAUGE (N)	179	172	176	179	179	179	179	178	151	156	178	176		
		COCKPIT	180	172	177	177	183	181	180	175	150	154	176	176		
		DELTA	+1	0	+1	-2	+4	+2	+1	-3	-1	-2	-2	0		
10/08/80	16°	GAUGE (C)	186	169	177	177	176	177	172	176	147	162	177	177		
		COCKPIT	185	168	177	175	176	177	170	174	146	160	176	176		
		DELTA	-1	-1	0	-2	0	0	-2	-2	-1	-2	-1	-1		
10/11/80	7°	GAUGE (N)	175	180	179	177	176	179	173	176	149	151	185	185		
		COCKPIT	171	177	177	171	174	175	172	173	144	147	180	181		
		DELTA	-4	-3	-2	-6	-2	-4	-1	-3	-5	-4	-5	-4		
10/12/80	7°	GAUGE (N)	179	189	185	182	180	182	180	180	150	158	200	200		
		COCKPIT	175	186	182	178	180	183	178	175	145	153	195	193		
		DELTA	-4	-3	-3	-4	0	+1	-2	-5	-5	-5	-5	-7		
10/13/80	10°	GAUGE (N)	174	180	180	180	178	179	180	175	150	155	184	187		
		COCKPIT	170	177	176	174	176	176	177	173	146	150	181	184		
		DELTA	-4	-3	-4	-6	-2	-3	-3	-2	-4	-5	-3	-3		
10/17/80	9°	GAUGE (N)	190	190	190	187	190	190	190	187	155	157	200	198		
		COCKPIT	185	187	187	179	188	185	188	183	151	150	194	193		
		DELTA	-5	-3	-3	-8	-2	-5	-2	-4	-4	-7	-6	-5		
10/18/80	5°	GAUGE (N)	182	185	183	178	185	185	185	178	149	154	192	192		
		COCKPIT	181	185	184	177	185	184	185	180	150	151	191	190		
		DELTA	-1	0	+1	-1	0	-1	0	+2	+1	-3	-1	-2		
10/19/80	12°	GAUGE (N)	188	191	192	191	192	192	192	191	161	165	196	196		
		COCKPIT	185	189	190	187	190	189	191	188	157	165	192	191		
		DELTA	-3	-2	-2	-4	-2	-3	-1	-3	-4	0	-4	-5		
10/22/80	6°	GAUGE (N)	189	191	189	193	198	193	189	188	162	165	193	193		
		COCKPIT	191	189	187	188	196	191	190	186	160	163	189	190		
		DELTA	+2	-2	-2	-5	-2	-2	+1	-2	-2	-2	-4	-3		

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DATE	OUTSIDE AIR TEMP (°C)	TIRE PRESSURE READOUT (PSI)												
			1	2	3	4	5	6	7	8	9	10	NL	NR
10/25/80	22°	GAUGE (N)	181	188	185	188	185	185	188	187	160	161	190	190
		COCKPIT	177	185	185	177	183	185	187	182	155	158	188	188
		DELTA	-4	-3	0	-11	-2	0	-1	-5	-5	-3	-2	-2
10/27/80	9°	GAUGE (N)	178	185	185	179	185	186	186	183	156	159	191	191
		COCKPIT	176	182	183	173	184	182	188	180	154	156	185	184
		DELTA	-2	-3	-2	-6	-1	-4	+2	-3	-2	-3	-6	-7
10/30/80	11°	GAUGE (C)	174	181	181	177	180	183	181	179	156	157	189	189
		COCKPIT	172	181	182	174	180	182	185	178	154	155	189	189
		DELTA	-2	0	+1	-3	0	-1	+4	-1	-2	-2	0	0
10/31/80	(?)	GAUGE (C)	171	179	179	173	175	183	179	173	151	156	188	188
		COCKPIT	169	179	178	172	175	182	179	173	149	154	186	186
		DELTA	-2	0	-1	-1	0	-1	0	0	-2	-2	-2	-2
11/01/80	21°	GAUGE (C)	174	179	184	179	177	184	186	180	154	157	191	190
		COCKPIT	171	179	185	177	178	183	188	179	154	156	190	188
		DELTA	-3	0	+1	-2	+1	-1	+2	-1	0	-1	-1	-2
11/03/80	10°	GAUGE (N)	172	178	182	180	178	183	185	180	153	158	188	190
		COCKPIT	167	174	180	173	173	179	183	175	149	153	185	186
		DELTA	-5	-4	-2	-7	-5	-4	-2	-5	-4	-5	-3	-4
11/04/80	1°	GAUGE (N)	171	175	171	171	172	174	174	169	149	149	179	179
		COCKPIT	168	174	172	169	173	175	174	169	148	150	179	180
		DELTA	-3	-1	+1	-2	+1	+1	0	0	-1	+1	0	+1
11/06/80	15°	GAUGE (N)	184	182	180	180	182	180	182	192	160	156	192	190
		COCKPIT	182	182	181	179	183	182	184	189	162	156	192	192
		DELTA	-2	0	+1	-1	+1	+2	+2	-3	+2	0	0	+2
11/08/80	21°	GAUGE (N)	178	188	188	188	179	189	191	176	159	164	196	196
		COCKPIT	173	185	184	182	176	185	190	172	155	159	194	194
		DELTA	-5	-3	-4	-6	-3	-4	-1	-4	-4	-5	-2	-2
11/09/80	(?)	GAUGE (N)	185	189	188	191	185	189	195	186	159	164	195	196
		COCKPIT	180	185	183	187	181	185	195	182	155	161	192	193
		DELTA	-5	-4	-5	-4	-4	-4	0	-4	-4	-3	-3	-3
11/11/80	3°	GAUGE (N)	182	185	176	182	182	185	186	181	152	156	188	186
		COCKPIT	174	182	171	177	180	183	191	177	151	155	185	186
		DELTA	-8	-3	-5	-5	-2	-2	+5	-4	-1	-1	-3	0
11/13/80	0°	GAUGE (N)	180	190	165	178	172	179	179	170	148	155	180	182
		COCKPIT	---	184	161	172	169	175	177	165	143	150	177	179
		DELTA	(?)	-6	-4	-6	-3	-4	-2	-5	-5	-5	-3	-3

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C* = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)											
			1	2	3	4	5	6	7	8	9	10	NL	NR
11/15/80	17°	GAUGE (N)	182	182	184	182	182	195	184	182	157	157	187	192
		COCKPIT	182	181	184	181	181	194	187	181	156	158	186	194
		DELTA	0	-1	0	-1	-1	-1	+3	-1	-1	+1	-1	+2
11/17/80	18°	GAUGE (C)	179	182	184	184	184	184	184	181	157	161	187	188
		COCKPIT	181	183	184	183	184	184	186	181	156	160	185	188
		DELTA	+2	+1	0	-1	0	0	+2	0	-1	-1	-2	0
11/19/80	18°	GAUGE (N)	190	190	190	190	190	190	190	190	160	163	195	195
		COCKPIT	189	189	190	188	189	189	190	189	160	162	189	190
		DELTA	-1	-1	0	-2	-1	-1	0	-1	0	-1	-6	-5
11/21/80	20°	GAUGE (N)	181	183	190	191	184	186	189	188	161	163	186	193
		COCKPIT	177	181	188	188	181	182	192	187	157	160	187	191
		DELTA	-4	-2	-2	-3	-3	-4	+3	-1	-4	-3	+1	-2
11/22/80	10°	GAUGE (N)	180	182	185	190	185	182	188	187	159	162	182	195
		COCKPIT	177	181	184	186	183	181	188	186	157	160	184	194
		DELTA	-3	-1	-1	-4	-2	-1	0	-1	-2	-2	+2	-1
11/25/80	18°	GAUGE (N)	185	176	178	179	178	178	179	178	155	156	188	196
		COCKPIT	183	175	177	179	179	178	181	176	153	155	189	196
		DELTA	-2	-1	-1	0	+1	0	+2	-2	-2	-1	+1	0
11/27/80	4°	GAUGE (N)	178	178	176	178	182	178	188	179	156	156	172	178
		COCKPIT	178	178	177	177	183	177	190	179	156	157	170	177
		DELTA	0	0	+1	-1	+1	-1	+2	0	0	+1	-2	-1
11/29/80	-1°	GAUGE (N)	172	176	176	181	179	178	179	183	154	158	186	188
		COCKPIT	168	171	173	176	175	173	178	179	150	152	177	181
		DELTA	-4	-5	-3	-5	-4	-5	-1	-4	-4	-6	-9	-7
11/30/80	1°	GAUGE (N)	164	169	168	175	171	171	166	171	145	149	178	182
		COCKPIT	165	171	168	173	172	172	171	171	146	149	178	182
		DELTA	+1	+2	0	-2	+1	+1	+5	0	+1	0	0	0
12/02/80	15°	GAUGE (N)	185	182	175	182	186	185	182	182	149	168	191	195
		COCKPIT	182	178	170	176	182	181	180	178	148	157	187	190
		DELTA	-3	-4	-5	-6	-4	-4	-2	-4	-1	-11	-4	-5
12/04/80	8°	GAUGE (N)	191	188	189	189	191	191	189	189	165	159	198	203
		COCKPIT	184	180	182	180	184	183	183	181	159	147	191	195
		DELTA	-7	-8	-7	-9	-7	-8	-6	-8	-6	-12	-7	-8
12/06/80	19°	GAUGE (N)	196	192	188	199	199	192	192	193	171	162	196	199
		COCKPIT	193	189	184	190	196	190	190	189	165	156	190	194
		DELTA	-3	-3	-4	-9	-3	-2	-2	-4	-6	-6	-6	-5

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C^o = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

DATE	OUTSIDE AIR TEMP (°C)	TIRE PRESSURE READOUT (PSI)													
			1	2	3	4	5	6	7	8	9	10	NL	NR	
12/10/80	-40	GAUGE (N)	186	185	172	199	186	186	181	182	159	152	192	191	
		COCKPIT	183	180	169	189	183	183	179	177	154	145	186	186	
		DELTA	-3	-5	-3	-10	-3	-3	-2	-5	-5	-7	-6	-5	
12/12/80	180	GAUGE (N)	195	189	181	195	195	191	189	191	165	169	193	196	
		COCKPIT	187	184	172	186	188	186	185	183	157	161	185	189	
		DELTA	-8	-5	-9	-9	-7	-5	-4	-8	-8	-8	-8	-7	
12/14/80	70	GAUGE (N)	191	186	175	193	189	188	188	189	164	155	192	195	
		COCKPIT	186	183	170	189	186	185	186	185	158	150	186	189	
		DELTA	-5	-3	-5	-4	-3	-3	-2	-4	-6	-5	-6	-6	
12/16/80	70	GAUGE (N)	187	183	182	190	190	185	193	180	160	158	205	187	
		COCKPIT	184	182	178	186	185	184	184	186	156	154	201	183	
		DELTA	-3	-1	-4	-4	-5	-1	-9	+6	-4	-4	-4	-4	
12/19/80	180	GAGUE (N)	191	186	182	188	191	189	183	186	164	162	195	191	
		COCKPIT	186	183	176	183	186	185	182	182	158	156	190	186	
		DELTA	-5	-3	-6	-5	-5	-4	-1	-4	-6	-6	-5	-5	
12/21/80	150	GAUGE (N)	188	182	178	186	185	186	183	172	158	156	191	185	
		COCKPIT	186	180	175	181	182	183	183	169	155	154	188	182	
		DELTA	-2	-2	-3	-5	-3	-3	0	-3	-3	-2	-3	-3	
12/23/80	190	GAUGE (C)	182	181	182	181	179	182	181	174	158	154	189	187	
		COCKPIT	184	180	179	181	180	183	183	173	156	153	189	185	
		DELTA	+2	-1	-3	0	+1	+1	+2	-1	-2	-1	0	-2	
12/27/80	-10	GAUGE (N)	179	179	179	179	179	179	179	179	155	155	189	189	
		COCKPIT	177	174	175	171	176	176	177	172	152	150	182	183	
		DELTA	-2	-5	-4	-8	-3	-3	-2	-7	-3	-5	-7	-6	
12/28/80	-10	GAUGE (N)	190	190	180	185	185	185	190	185	160	165	190	190	
		COCKPIT	188	188	175	182	187	185	189	181	160	161	184	184	
		DELTA	-2	-2	-5	-3	+2	0	-1	-4	0	-4	-6	-6	
12/30/80	160	GAUGE (N)	183	183	188	181	182	183	192	179	158	159	191	192	
		COCKPIT	179	178	185	174	179	179	187	173	154	153	184	186	
		DELTA	-4	-5	-3	-7	-3	-4	-5	-6	-4	-6	-7	-6	
01/02/81	00	GAUGE (N)	175	174	176	174	176	174	178	178	149	148	189	192	
		COCKPIT	172	172	174	175	172	172	173	174	150	150	190	191	
		DELTA	-3	-2	-2	+1	-4	-2	-5	-4	+1	+2	+1	-1	
01/03/81	50	GAUGE (N)	182	180	174	178	180	181	173	176	158	158	188	188	
		COCKPIT	179	177	171	172	178	178	171	170	153	152	180	182	
		DELTA	-3	-3	-3	-6	-2	-3	-2	-6	-5	-6	-8	-6	

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DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)												NL	NR
			1	2	3	4	5	6	7	8	9	10				
01/07/81	20	GAUGE (N)	181	182	171	179	181	182	172	172	156	157	185	197		
		COCKPIT	179	178	169	173	180	179	169	166	152	151	179	193		
		DELTA	-2	-4	-2	-6	-1	-3	-3	-6	-4	-6	-6	-4		
01/09/81	160	GAUGE (C)	181	184	172	179	181	181	175	174	161	160	184	188		
		COCKPIT	186	187	172	179	182	182	176	172	158	158	182	192		
		DELTA	+5	+3	0	0	+1	+1	+1	-2	-3	-2	-2	+4		
01/11/81	150	GAUGE (C)	169	181	166	180	180	180	168	170	153	156	179	189		
		COCKPIT	169	180	168	179	181	181	170	169	152	156	178	190		
		DELTA	0	-1	+2	-1	+1	+1	+2	-1	-1	0	-1	+1		
01/12/81	200	GAUGE (C)	168	179	174	181	179	179	179	168	151	155	181	188		
		COCKPIT	166	177	175	172	180	181	179	163	149	153	179	189		
		DELTA	-2	-2	+1	-9	+1	+2	0	-5	-2	-2	-2	+1		
01/14/81	10	GAUGE (N)	169	174	169	169	174	169	174	186	146	149	182	182		
		COCKPIT	168	172	172	168	175	172	185	185	144	150	182	183		
		DELTA	-1	-2	+3	-1	+1	+3	+11	-1	-2	+1	0	+1		
01/15/81	00	GAUGE (N)	176	182	182	178	183	181	185	181	155	156	186	185		
		COCKPIT	178	181	184	177	185	181	186	181	157	157	183	183		
		DELTA	+2	+1	+2	-1	+2	0	+1	0	+2	+1	-3	-2		
01/17/81	50	GAUGE (N)	162	178	174	182	178	172	174	171	146	156	189	182		
		COCKPIT	163	177	175	180	178	173	176	171	145	---	190	182		
		DELTA	+1	-1	+1	-2	0	+1	+2	0	-1	(?)	+1	0		
01/18/81	40	GAUGE (N)	171	178	175	174	172	174	175	171	149	151	185	185		
		COCKPIT	172	177	177	170	177	174	179	172	147	---	180	182		
		DELTA	+1	-1	+2	-4	+5	0	+4	+1	-2	(?)	-5	-3		
01/20/81	120	GAUGE (C)	174	181	181	172	187	181	181	175	152	152	181	185		
		COCKPIT	174	182	180	170	185	179	184	176	151	---	180	184		
		DELTA	0	+1	-1	-2	-2	-2	+3	+1	-1	(?)	-1	-1		
01/21/81	160	GAUGE (C)	180	180	180	180	180	180	180	180	155	160	190	190		
		COCKPIT	176	178	180	175	180	178	180	177	151	158	186	188		
		DELTA	-4	-2	0	-5	0	-2	0	-3	-4	-2	-4	-2		
01/24/81	150	GAUGE (C)	177	177	177	177	177	177	177	177	152	152	187	187		
		COCKPIT	176	178	180	176	179	178	179	178	151	151	188	188		
		DELTA	-1	+1	+3	-1	+2	+1	+2	+1	-1	-1	+1	+1		
01/25/81	20	GAUGE (N)	180	182	182	182	185	186	186	186	160	156	186	184		
		COCKPIT	178	180	182	179	181	184	185	182	154	152	183	181		
		DELTA	-2	-2	0	-3	-4	-2	-1	-4	-6	-4	-3	-3		

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DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)											
			1	2	3	4	5	6	7	8	9	10	NL	NR
01/27/81	100	GAUGE (N)	190	183	182	180	190	186	180	182	156	155	190	200
		COCKPIT	186	182	182	179	188	187	181	180	155	155	192	195
		DELTA	-4	-1	0	-1	-2	+1	+1	-2	-1	0	+2	-5
01/29/81	-30	GAUGE (N)	171	168	172	171	161	174	171	171	146	145	179	165
		COCKPIT	172	170	173	170	165	175	173	172	145	144	180	167
		DELTA	+1	+2	+1	-1	+4	+1	+2	+1	-1	-1	+1	+2
01/30/81	130	GAUGE (C)	178	179	181	181	185	182	184	184	155	152	185	188
		COCKPIT	177	179	183	180	186	182	186	183	155	150	185	187
		DELTA	-1	0	+2	-1	+1	0	+2	-1	0	-2	0	-1
02/04/81	40	GAUGE (C*)	166	181	---	180	181	182	182	173	148	145	188	190
		COCKPIT	165	181	175	179	181	182	182	172	147	145	188	189
		DELTA	-1	0	(?)	-1	0	0	0	-1	-1	0	0	-1
02/06/81	170	GAUGE (C)	178	177	180	178	179	175	178	175	148	146	187	188
		COCKPIT	177	176	181	173	180	177	180	173	147	145	187	188
		DELTA	-1	-1	+1	-5	+1	+2	+2	-2	-1	-1	0	0
02/08/81	140	GAUGE (C)	177	178	181	178	181	180	180	175	148	145	191	191
		COCKPIT	175	178	184	178	182	180	181	177	151	147	191	191
		DELTA	-2	0	+3	0	+1	0	+1	+2	+3	+2	0	0
02/10/81	150	GAUGE (C*)	177	172	187	184	185	185	176	184	156	144	190	190
		COCKPIT	177	173	189	184	185	185	178	184	157	145	190	188
		DELTA	0	+1	+2	0	0	0	+2	0	+1	+1	0	-2
02/10/18	190	GAUGE (C)	173	168	180	176	179	182	168	176	153	142	189	189
		COCKPIT	170	163	181	174	179	183	167	174	150	140	188	188
		DELTA	-3	-5	+1	-2	0	+1	-1	-2	-3	-2	-1	-1
02/13/81	-20	GAUGE (N)	178	180	181	181	179	180	178	178	157	155	192	190
		COCKPIT	170	174	178	177	174	176	176	174	141	157	188	185
		DELTA	-8	-6	-3	-4	-5	-4	-2	-4	-16	+2	-4	-5
02/14/81	-20	GAUGE (N)	171	178	179	171	176	171	178	170	156	149	190	195
		COCKPIT	169	174	178	173	175	176	176	173	151	146	190	195
		DELTA	-2	-4	-1	+2	-1	+5	-2	+3	-5	-3	0	0
02/15/81	60	GAUGE (N)	179	172	178	181	178	185	175	181	156	148	188	193
		COCKPIT	179	171	178	180	177	184	176	181	154	142	188	192
		DELTA	0	-1	0	-1	-1	-1	+1	0	-2	-6	0	-1
02/17/81	160	GAUGE (C*)	177	171	177	181	178	186	175	185	---	---	185	189
		COCKPIT	175	169	178	179	177	185	176	183	---	---	184	187
		DELTA	-2	-2	+1	-2	-1	-1	+1	-2	---	---	-1	-2

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DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)											
			1	2	3	4	5	6	7	8	9	10	NL	NR
02/17/81	160	GAUGE (C)	176	171	176	181	176	184	176	184	170	168	188	188
		COCKPIT	174	170	177	180	176	183	175	182	165	168	188	188
		DELTA	-2	-1	+1	-1	0	-1	-1	-2	-5	0	0	0
02/19/81	-20	GAUGE (N)	169	169	171	176	174	182	169	179	152	161	179	188
		COCKPIT	169	165	174	175	174	183	173	179	153	161	177	188
		DELTA	0	-4	+3	-1	0	+1	+4	0	+1	0	-2	0
02/21/81	130	GAUGE (C)	171	169	178	182	176	183	178	185	156	163	175	188
		COCKPIT	169	165	179	180	175	183	178	184	155	162	173	185
		DELTA	-2	-4	+1	-2	-1	0	0	-1	-1	-1	-2	-3
02/23/81	160	GAUGE (C)	191	169	178	182	178	187	177	187	156	166	172	185
		COCKPIT	190	170	179	183	179	187	180	188	156	166	170	183
		DELTA	-1	+1	+1	+1	+1	0	+3	+1	0	0	-2	-2
02/26/81	200	GAUGE (C)	186	174	175	177	176	184	175	183	155	164	187	185
		COCKPIT	184	169	175	175	176	182	179	181	152	161	185	182
		DELTA	-2	-5	0	-2	0	-2	+4	-2	-3	-3	-2	-3
02/28/81	-20	GAUGE (N)	181	172	176	173	177	182	176	183	155	162	182	182
		COCKPIT	177	166	173	168	172	178	174	180	151	158	176	177
		DELTA	-4	-6	-3	-5	-5	-4	-2	-3	-4	-4	-6	-5
03/01/81	+170	GAUGE (C)	186	172	178	176	180	186	178	186	156	166	186	191
		COCKPIT	184	170	179	174	179	184	180	186	157	164	182	191
		DELTA	-2	-2	+1	-2	-1	-2	+2	0	+1	-2	-4	0
03/03/81	100	GAUGE (C)	185	173	177	177	181	187	178	185	157	165	182	178
		COCKPIT	184	169	176	175	179	185	177	184	156	162	179	177
		DELTA	-1	-4	-1	-2	-2	-2	-1	-1	-1	-3	-3	-1
03/04/81	40	GAUGE (C)	178	167	174	174	166	181	174	182	154	161	177	174
		COCKPIT	177	166	173	170	165	181	175	181	152	160	176	173
		DELTA	-1	-1	-1	-4	-1	0	+1	-1	-2	-1	-1	-1
03/07/81	200	GAUGE (N)	190	181	181	190	181	193	190	195	165	172	185	195
		COCKPIT	187	179	179	187	178	189	190	191	161	168	180	191
		DELTA	-3	-2	-2	-3	-3	-4	0	-4	-4	-4	-5	-4
03/10/81	210	GAUGE (C)	178	174	175	178	180	185	179	185	154	165	182	192
		COCKPIT	178	171	175	178	181	183	181	183	153	163	181	192
		DELTA	0	-3	0	0	+1	-2	+2	-2	-1	-2	-1	0
03/17/81	50	GAUGE (N)	183	183	175	178	185	185	183	185	159	164	189	191
		COCKPIT	181	181	176	176	183	183	183	183	156	162	184	188
		DELTA	-2	-2	+1	-2	-2	-2	0	-2	-3	-2	-5	-3

C = DATA PROVIDED BY CALIBRATED HAND-HELD GAUGE, ± 2 PSI

N = DATA PROVIDED BY NONCALIBRATED HAND-HELD GAUGE, ± 4 PSI

C* = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)												NL	NR
			1	2	3	4	5	6	7	8	9	10				
03/21/81	7°	GAUGE (C)	182	179	176	181	178	182	177	184	158	161	189	187		
		COCKPIT	181	178	179	180	179	180	179	183	157	160	189	187		
		DELTA	-1	-1	+3	-1	+1	-2	+2	-1	-1	-1	0	0		
03/25/81	17°	GAUGE (C)	184	185	181	181	182	188	181	180	161	166	196	194		
		COCKPIT	185	185	184	187	182	188	184	181	160	166	194	191		
		DELTA	+1	0	+3	+6	0	0	+3	+1	-1	0	-2	-3		
03/26/18	12°	GAUGE (N)	190	189	189	191	189	191	190	179	170	170	193	190		
		COCKPIT	189	185	190	188	185	188	188	173	166	166	189	186		
		DELTA	-1	-4	+1	-3	-4	-3	-2	-6	-4	-4	-4	-4		
03/29/81	17°	GAUGE (C)	180	175	161	180	173	182	178	171	158	156	189	188		
		COCKPIT	181	179	182	184	177	181	181	166	160	156	186	185		
		DELTA	+1	+4	+1	+4	+4	-1	+3	-5	+2	0	-3	-3		
04/01/81	13°	GAUGE (C*)	183	192	185	189	179	189	183	191	163	152	190	186		
		COCKPIT	183	194	189	190	179	189	185	190	163	152	189	185		
		DELTA	0	+2	+4	+1	0	0	+2	-1	0	0	-1	-1		
04/05/81	25°	GAUGE (N)	180	185	180	185	180	185	185	190	160	152	189	184		
		COCKPIT	179	186	184	184	176	184	182	187	160	149	184	181		
		DELTA	-1	+1	+4	-1	-4	-1	-3	-3	0	-3	-5	-3		
04/08/81	20°	GAUGE (N)	182	191	185	185	180	189	181	189	165	151	195	190		
		COCKPIT	181	191	184	181	177	186	180	183	160	147	190	185		
		DELTA	-1	0	-1	-4	-3	-3	-1	-6	-5	-4	-5	-5		
04/11/81	18°	GAUGE (C)	178	184	178	182	175	180	171	185	160	148	185	188		
		COCKPIT	177	184	180	179	174	180	171	181	158	147	183	187		
		DELTA	-1	0	+2	-3	-1	0	0	-4	-2	-1	-2	-1		
04/12/81	21°	GAUGE (N)	188	192	190	181	185	191	179	195	170	159	191	181		
		COCKPIT	187	194	192	180	182	190	180	194	168	156	189	180		
		DELTA	-1	+2	+2	-1	-3	-1	+1	-1	-2	-3	-2	-1		
04/14/81	23°	GAUGE (N)	182	190	184	175	180	187	174	187	163	152	191	186		
		COCKPIT	179	187	183	171	176	184	173	183	160	149	189	183		
		DELTA	-3	-3	-1	-4	-4	-3	-1	-4	-3	-3	-2	-3		
04/15/81	20°	GAUGE (N)	180	185	182	173	175	180	172	187	158	148	198	185		
		COCKPIT	174	181	182	169	171	178	169	181	155	144	193	182		
		DELTA	-6	-4	0	-4	-4	-2	-3	-6	-3	-4	-5	-3		
04/16/81	18°	GAUGE (N)	180	180	180	180	180	180	180	180	165	155	190	185		
		COCKPIT	183	183	183	179	184	183	182	179	164	154	192	183		
		DELTA	+3	+3	+3	-1	+4	+3	+2	-1	-1	-1	+2	-2		

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N = DATA PROVIDED BY NONCALIBRATED HAND-HELD GAUGE, ± 4 PSI

C* = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)												
DATE			1	2	3	4	5	6	7	8	9	10	NL	NR
04/18/81	100	GAUGE (N)	185	188	188	188	185	188	185	185	160	155	185	188
		COCKPIT	182	186	188	183	181	184	184	181	155	151	180	184
		DELTA	-3	-2	0	-5	-4	-4	-1	-4	-5	-4	-5	-4
04/19/81	100	GAUGE (N)	185	189	188	189	186	186	185	188	162	162	192	189
		COCKPIT	186	190	190	188	184	187	187	188	159	159	187	186
		DELTA	+1	+1	+2	-1	-2	+1	+2	0	-3	-3	-5	-3
04/21/81	180	GAUGE (C)	183	185	185	183	184	184	183	184	154	154	192	191
		COCKPIT	184	185	188	182	184	184	185	182	153	154	192	191
		DELTA	+1	0	+3	-1	0	0	+2	-2	-1	0	0	0
04/22/81	110	GAUGE (N)	182	185	180	185	182	182	182	184	152	152	198	196
		COCKPIT	177	182	184	177	179	178	180	178	149	151	195	194
		DELTA	-5	-3	+4	-8	-3	-4	-2	-6	-3	-1	-3	-2
04/24/81	70	GAUGE (N)	185	185	186	185	185	179	185	185	156	156	191	185
		COCKPIT	181	182	189	180	181	178	185	181	153	152	184	184
		DELTA	-4	-3	+3	-5	-4	-1	0	-4	-3	-4	-7	-1
04/26/81	180	GAUGE (C)	179	178	179	178	180	174	179	178	149	153	187	186
		COCKPIT	178	178	181	174	179	174	179	176	148	150	185	184
		DELTA	-1	0	+2	-4	-1	0	0	-2	-1	-3	-2	-2
04/30/81	220	GAUGE (C)	180	180	181	180	183	177	181	180	157	159	194	196
		COCKPIT	179	179	183	176	182	175	181	177	155	157	192	194
		DELTA	-1	-1	+2	-4	-1	-2	0	-3	-2	-2	-2	-2
05/02/81	90	GAUGE (N)	180	180	185	180	178	175	180	180	155	155	195	195
		COCKPIT	177	181	184	176	173	172	179	177	153	154	189	191
		DELTA	-3	+1	-1	-4	-5	-3	-1	-3	-2	-1	-6	-4
05/04/81	190	GAUGE (C)	179	177	182	177	171	184	179	179	154	159	189	189
		COCKPIT	181	177	178	174	168	184	178	176	153	156	188	190
		DELTA	+2	0	-4	-3	-3	0	-1	-3	-1	-3	-1	+1
05/04/81	HANGAR	GAUGE (C*)	183	178	185	177	170	167	179	178	154	157	188	189
		COCKPIT	183	178	180	174	169	167	178	175	153	156	186	189
		DELTA	0	0	-5	-3	-1	0	-1	-3	-1	-1	-2	0
05/07/81	180	GAUGE (N)	176	185	181	179	186	189	181	181	159	161	195	192
		COCKPIT	176	182	175	172	184	188	178	174	155	156	193	189
		DELTA	0	-3	-6	-7	-2	-1	-3	-7	-4	-5	-2	-3
05/09/81	130	GAUGE (N)	176	183	188	181	186	189	186	182	161	161	200	198
		COCKPIT	174	182	181	177	182	186	185	179	157	157	198	196
		DELTA	-2	-1	-7	-4	-4	-3	-1	-3	-4	-4	-2	-2

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N = DATA PROVIDED BY NONCALIBRATED HAND-HELD GAUGE, ± 4 PSI

C* = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

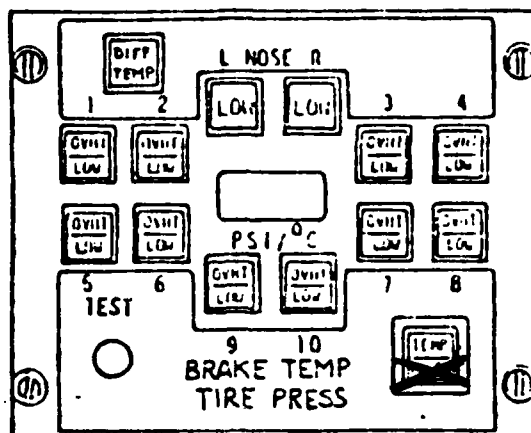
DATE	OUTSIDE AIR TEMP (°C)		TIRE PRESSURE READOUT (PSI)											
			1	2	3	4	5	6	7	8	9	10	NL	NR
05/10/81	25°	GAUGE (N)	180	190	190	193	193	190	190	190	167	170	198	198
		COCKPIT	179	189	185	185	190	191	189	187	164	166	193	195
		DELTA	-1	-1	-5	-8	-3	+1	-1	-3	-3	-4	-5	-3
05/15/81	18°	GAUGE (C)	180	176	182	179	180	178	180	175	155	161	182	182
		COCKPIT	181	176	178	178	180	177	183	174	154	159	181	182
		DELTA	+1	0	-4	-1	0	-1	+3	-1	-1	-2	-1	0
05/18/81	(?)	GAUGE (N)	190	186	182	184	184	188	184	180	158	156	182	194
		COCKPIT	187	180	176	175	184	186	182	173	157	152	179	191
		DELTA	-3	-6	-6	-9	0	-2	-2	-7	-1	-4	-3	-3
05/23/81	21°	GAUGE (C)	179	179	174	179	181	178	180	179	154	154	189	189
		COCKPIT	181	179	171	177	179	172	178	177	152	151	187	187
		DELTA	+2	0	-3	-2	-2	-6	-2	-2	-2	-3	-2	-2
05/25/81	17°	GAUGE (N)	179	179	178	182	179	175	176	179	151	151	189	183
		COCKPIT	183	181	174	182	182	176	179	181	153	153	190	184
		DELTA	+4	+2	-4	0	+3	+1	+3	+2	+2	+2	+1	+1
05/26/81	15°	GAUGE (N)	180	181	178	180	180	178	178	178	151	151	180	183
		COCKPIT	176	177	170	175	176	172	175	174	146	146	176	179
		DELTA	-4	-4	-8	-5	-4	-6	-3	-4	-5	-5	-4	-4
05/27/81	(?)	GAUGE (N)	180	179	175	179	180	175	175	173	151	150	180	182
		COCKPIT	180	175	167	171	177	170	173	170	147	144	174	179
		DELTA	0	-4	-8	-8	-3	-5	-2	-3	-4	-6	-6	-3
05/28/81	22°	GAUGE (C)	183	180	179	190	185	178	180	182	158	155	183	185
		COCKPIT	185	179	174	186	183	175	181	180	157	154	182	182
		DELTA	+2	-1	-5	-4	-2	-3	+1	-2	-1	-1	-1	-3

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N = DATA PROVIDED BY NONCALIBRATED HAND-HELD GAUGE, ± 4 PSI

C* = DATA PROVIDED BY CALIBRATED PRECISION TEST GAUGE OF ± 0.5 PERCENT

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date APRIL 7, 1980 Flight 146/147 Airport Code SCL

Outside Air Temp. 25°C Time of Day 1530

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.												

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

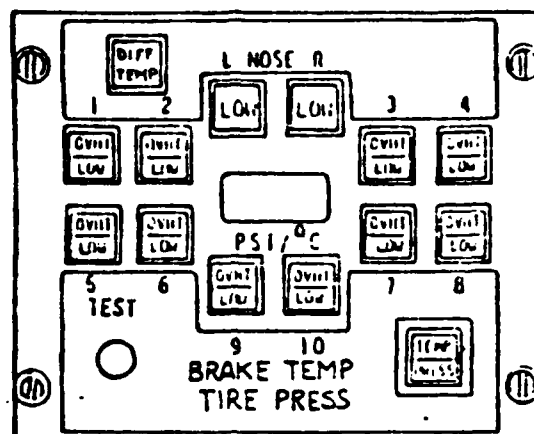
Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

PRESSURE MODE REMAINS ON ALL THE TIME. IF PUSHED, "PRESS" STAYS ON, BUT PSI/°C WINDOW GOES BLANK. DURING TEST MODE, PSI/°C WINDOW GOES TO BLANK TOO. TIRE PRESSURE CHECK MANUALLY IS OK.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date APRIL 8, 1980 Flight 147 Airport Code DKR
Outside Air Temp. 20°C Time of Day 0930

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.												

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

SYSTEM BLOCKED IN PRESSURE MODE WITH ACTUAL PRESSURE DISPLAY.

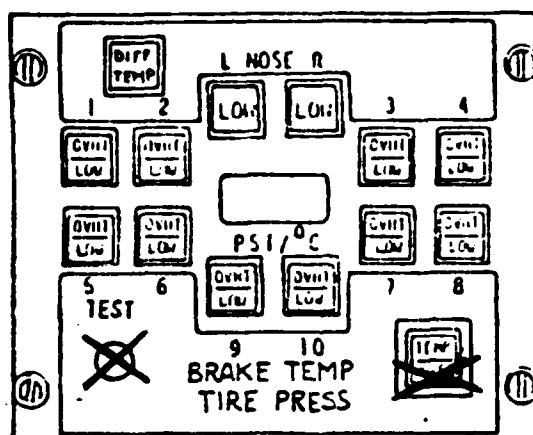
SYSTEM WORKED NORMAL AFTER DEPRESSING OVHT/LOW SWITCH #6.

ALSO TEST MODE NORMAL AGAIN.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date APRIL 8, 1980 Flight 147 Airport Code GIG

Outside Air Temp. 26°C Time of Day 2343

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.												

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

WITH "PRESS" LIGHT ON, WINDOW INDICATOR NOT BLANK. WITH TEST

BUTTON DEPRESSED, WINDOW BLANK. AFTER PULL/PUSH C/B B-12.

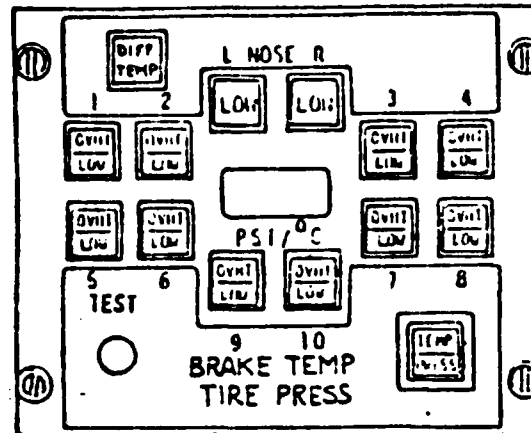
WINDOW BLANK FOR 1 TO 2 SECONDS. WITH PRESS/TEMP NODE SELECT

DEPRESSED, WINDOW BLANK TOO.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date APRIL 8, 1980 Flight 394 Airport Code ZRH - DHA

Outside Air Temp. -51°C Time of Day 2300

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.												

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

DURING CRUISE, BRAKE TEMP IND. STARTS BLINKING (24°C). TEST

SHOWS ALSO 24°C STEADY. UNABLE TO CHECK INDIVIDUAL BRAKE TEMP.

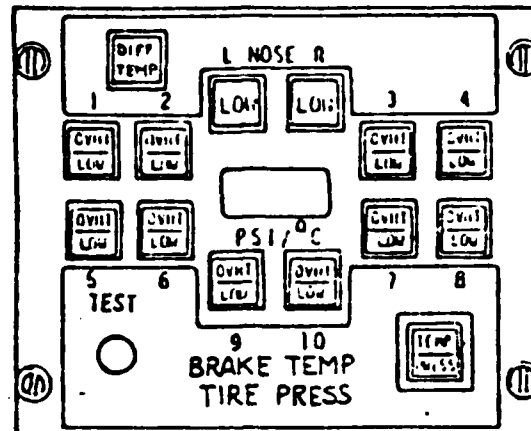
SELECTION OF PRESSURE MODE NOT POSSIBLE. CYCLING C/B B-12

RESUMED NORMAL OPERATION.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date APRIL 13, 1980 Flight 332 Airport Code ZRH

Outside Air Temp. 17°C Time of Day 1330

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	186	185	185	186	185	185	188	186	162	160	192	203

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	NO TEMPERATURE INDICATION									

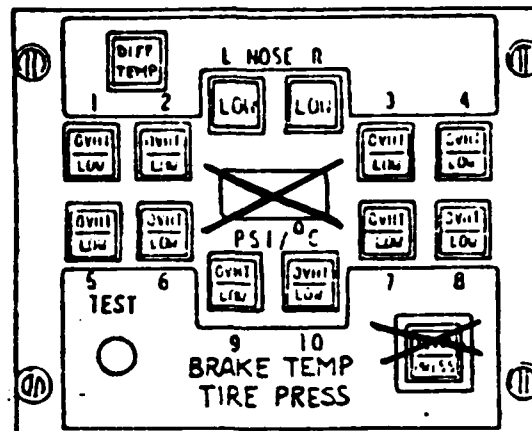
Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

"bbb" DISPLAYED ON TEST (INOPERATIVE BRAKE TEMP MONITORING).

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date APRIL 15, 1980 Flight 162 Airport Code CMB

Outside Air Temp. 26°C Time of Day 0900

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.												

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

NO TEMPERATURE INDICATION AFTER PUSHING TEST BUTTON. (GROUND

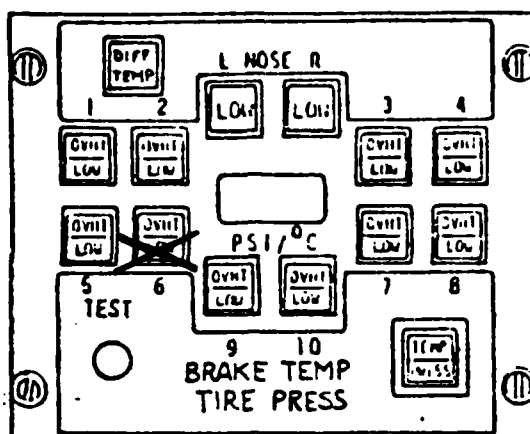
OR FLIGHT) PRESSURE OK AFTER C/B PULLED FOR ABOUT 35 MINUTES. OK

AGAIN. TEST SHOWS "bbb".

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date APRIL 28, 1980 Flight 146 Airport Code SCL

Outside Air Temp. 16°C Time of Day 1350

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	186	190	195	185	188	174	196	193	166	161	199	194

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	80	92	84	92	84	80	92	84	92	80

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

NORMAL BRAKING APPLICATIONS WITH #1 AND #3 REVERSERS. AFTER

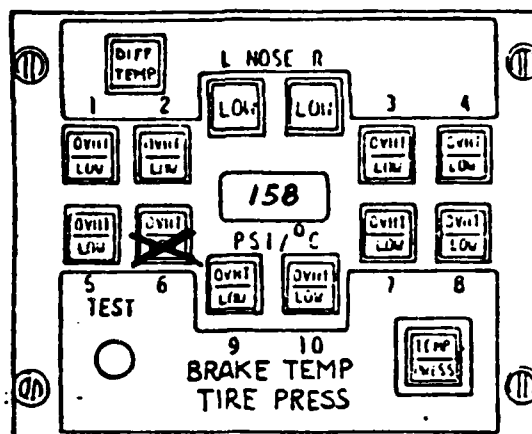
LANDING, WHEEL #6 "LOW" INDICATION. PUSHING WHEEL #6 IN PRESSURE

MODE INDICATES 163 PSI. TEST OK.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date APRIL 29, 1980 Flight 147 Airport Code NKR - GVA

Outside Air Temp. -48°C Time of Day 1315

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	180	186	189	174	182	163	191	182	160	153	201	194

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	80	88	84	80	84	80	84	72	76	68

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

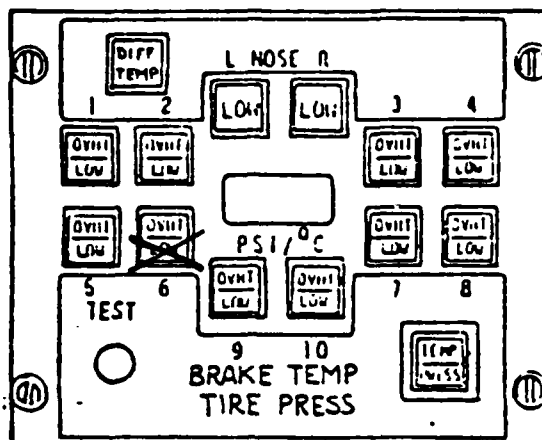
"LOW" PRESSURE LIGHT #6 IS ON SEVERAL TIMES AFTER TAKEOFF.

DURING CLIMB, TEST OK.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date APRIL 30, 1980 Flight 142 Airport Code VCP

Outside Air Temp. -44°C Time of Day 1440

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	199	196	198	188	203	165	200	201	174	201	202	197

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

"#6 WHEEL "LOW" LIGHT ON DURING CLIMB AND CRUISE. LIGHT WENT

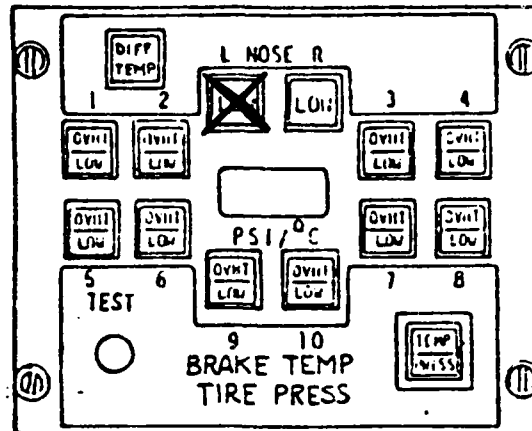
OFF 30 MINUTES LATER WITH AN INDICATED PRESSURE OF 173 PSI.

TEST "GO" AND NORMAL.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date MAY 1, 1980 Flight 143 Airport Code GIG - DKR

Outside Air Temp. -37°C Time of Day 0525

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	185	190	195	176	187	189	193	188	167	159	164	195

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	84	92	96	88	88	80	96	84	88	80

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

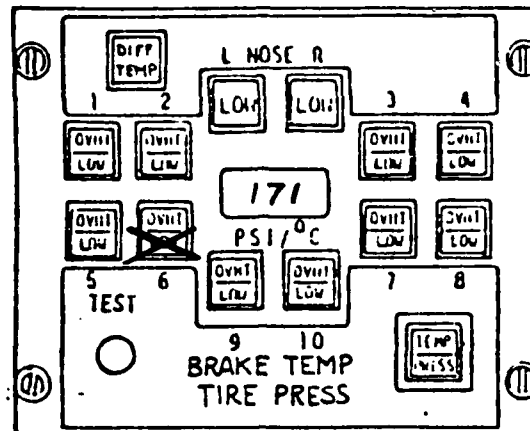
LEFT NOSE GEAR "LOW" LIGHT ON IN FLIGHT. ON GROUND, "LOW"

LIGHT COMES ON FOR SHORT PERIOD OF TIME DURING TIGHT TURNS.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date MAY 1, 1980 Flight 143 Airport Code DKR

Outside Air Temp. -20°C Time of Day 1040

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	200	196	202	191	201	171	200	204	169	165	*	203

* = INOPERATIVE

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

WHEEL #6 PSI INDICATOR UNSTABLE. 15 MINUTES AFTER TAKEOFF, #6

"LOW" LIGHT ON, INDICATES 171-176 PSI. AFTERWARD, "LOW" LIGHT

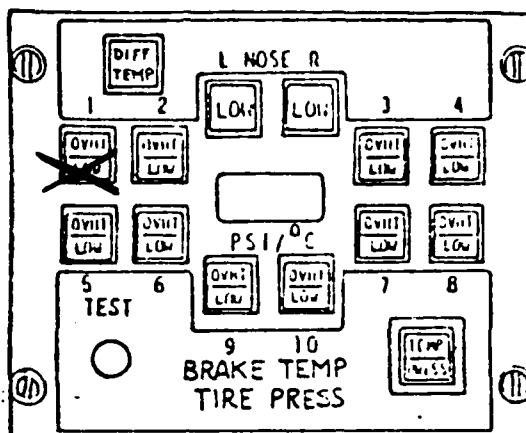
OFF AND INDICATES 189 PSI. DURING TEST, INDICATES F11; THAT

IS, LEFT NOSE WHEEL INOPERATIVE.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date NOVEMBER 7, 1980 Flight 293 Airport Code JED

Outside Air Temp. 32°C Time of Day 1000

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	-	199	197	191	188	198	199	181	161	165	220	216

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	124	120	128	92	112	100	112	112	96	88

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

TEST SHOWS "1", "LOW" PRESSURE LIGHT #1 COMES ON AFTER 10

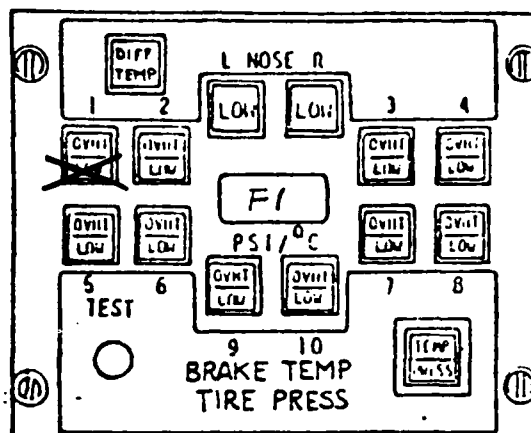
MINUTES ON GROUND. 35 MINUTES AFTER TAKEOFF, EVERYTHING IS OK

AGAIN.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date NOVEMBER 12, 1980 Flight 167 Airport Code BKK-BOM

Outside Air Temp. -43°C Time of Day 1600

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	4/193	206	191	204	208	208	211	196	168	177	214	215

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	116	116	100	96	132	120	112	108	112	108

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

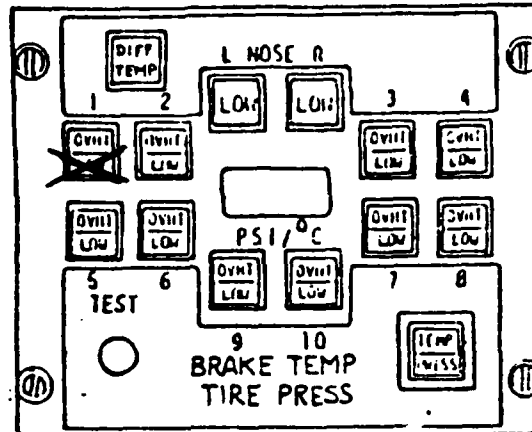
#1 WHEEL "LOW" PRESSURE LIGHT INTERMITTENT ON/OFF WITH "F1"

TEST INDICATION ON.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to Tiff.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date NOVEMBER 16, 1980 Flight 134 Airport Code ZRH

Outside Air Temp. 16°C Time of Day 1245

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	135	←				OK						→

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

"LOW" LIGHT #1 ON FROM TIME TO TIME. LOW INDICATION = 135 PSI.

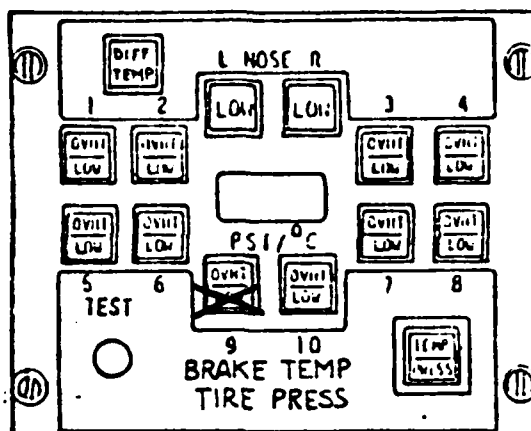
NORMAL INDICATION = 192 PSI. FOUND NORMAL PRESSURE BEFORE

PUSHBACK.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date DECEMBER 5, 1980 Flight 144 Airport Code DKR - GIG

Outside Air Temp. -35°C Time of Day 0600

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	203	201	199	197	201	204	202	197	174	201	220	219

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

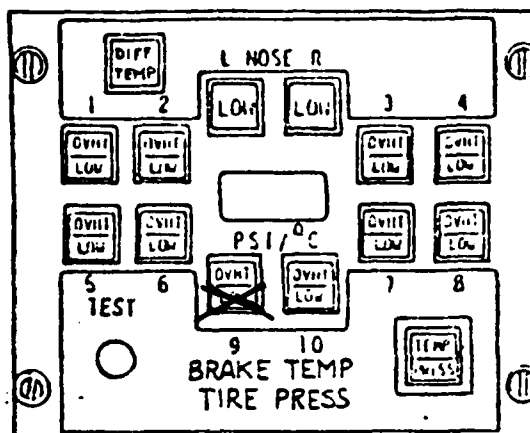
Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

"LOW" PRESSURE LIGHT COMES ON DURING CRUISE ON WHEEL #9.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date DECEMBER 6, 1980 Flight 145 Airport Code GIG - NKR
Outside Air Temp. -38°C Time of Day 0640

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	195	197	194	199	195	193	199	194	166	213		

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.										

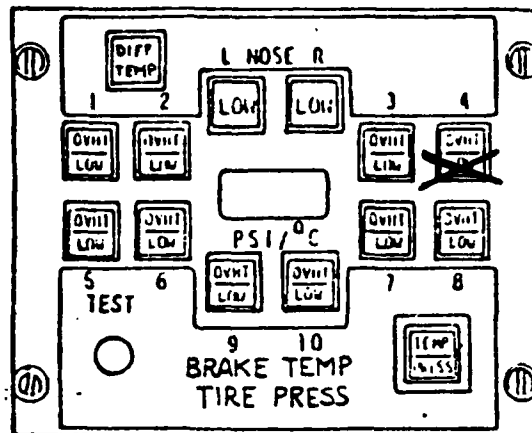
Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

"LOW" PRESSURE LIGHT COMES ON DURING CRUISE ON WHEEL #9.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFF.

TIRE PRESSURE MONITOR MALFUNCTION REPORT



Mark lights that are on with any explanatory notes required.

Date DECEMBER 10, 1980 Flight 195 Airport Code KHI - ZRH

Outside Air Temp. -60°C Time of Day 0400

Tire Pressures:

Wheel No.	1	2	3	4	5	6	7	8	9	10	NL	NR
Press.	174	180	171	143	175	181	179	172	149	138	212	204

Brake Temperatures:

Brake No.	1	2	3	4	5	6	7	8	9	10
Temp.	28	36	36	32	32	32	32	28	28	24

Remarks: Note things like amount of braking used if malfunction is after landing or rejected takeoff, time after braking or flight phase malfunction occurred, etc:

ALL OK DURING 5 HOURS OF FLIGHT (DEPRESS #4 = 170 PSI), THEN

"LOW" LIGHT ON WITH 143 PSI INDICATED. GROUND CHECK AT KHI =

180 PSI.

Note: Any LOW light indication requires a tire pressure check by maintenance prior to next takeoff.

Note: Send copy of Malfunction Report to TIFP.

DC-10 TIRE PRESSURE INDICATING SYSTEM
HB- IHA (FUS. #57)
FAIRCHILD SYSTEM
COCKPIT AND MAINTENANCE COMPLAINT LOG

04/06/80 Cockpit Complaint: Mode-select switch for brake temperature and tire pressure inoperative.

Action/Comment: Brake temperature and tire pressure selection were successfully checked on ground.

04/07/80 Cockpit Complaint: Impossible to select temperature display after the electrical switching during engine start.

Action/Comment: After 3 hours, recycle circuit breaker for 20 minutes provided normal system operation again.

04/07/80 Cockpit Complaint: Tire pressure mode remained on all the time.

Action/Comment: Brake temperature was checked manually.

04/08/80 Cockpit Complaint: Tire pressure mode was blocked. Actual pressure display was normal.

Action/Comment: System was normal again after depressing wheel #6 OVHT/LOW switch.

04/08/80 Cockpit Complaint: During cruise, brake temperature indicator started blinking at 240C. Test showed also 240C steady. Unable to check individual brake temperature. Selection of pressure mode was impossible.

Action/Comment: Cycling circuit breaker resumed normal operation.

04/09/80 Cockpit Complaint: Pressure mode was blocked on ground.

Action/Comment: Depressing wheel #10 OVHT/LOW switch put the system back in normal operation again.

4/10/80 Cockpit Complaint: Tire pressure mode blocked again.

 Action/Comment: None.

04/12/80 Cockpit Complaint: Tire pressure mode was blocked. Actual pressure display was normal. Depressing TEST switch provided blank display.

 Action/Comment: Depressing wheel #6 OVHT/LOW light/switch put the system back in normal operation again. The BTM/TPI system computer was replaced. Fairchild findings revealed switch closed (stuck), causing a program hang-up. This created the lockup of the mode selection.

04/12/80 Cockpit Complaint: During cruise, brake temperature indicator started blinking at 240C steady. Depressing TEST switch showed 240C steady. Unable to check individual brake temperature. Selection of pressure mode was impossible.

 Action/Comment: None.

04/13/80 Cockpit Complaint: No brake temperature indication. "bbb" displayed when TEST switch was depressed and released. This referred to inoperative brake temperature monitoring system.

 Action/Comment: Normal operation again after opened the circuit breaker for an hour.

04/15/80 Cockpit Complaint: No brake temperature indication during either ground or flight. Tire pressure operation was normal. Depressing and releasing TEST switch showed "bbb."

 Action/Comment: Pulled the circuit breaker for 30 minutes. Resumed normal system operation.

04/18/80 Cockpit Complaint: Inoperative brake temperature monitoring system. Depressing and releasing TEST switch showed "bbb."

Action/Comment: System operation was back to normal after 4 hours of flight time.

04/19/80 Cockpit Complaint: Inoperative brake temperature monitoring system. Pressure indication was normal. Depressing and releasing TEST switch showed "bbb."

Action/Comment: System operation was back in normal after 3 hours of flight time.

04/20/80 Cockpit Complaint: No brake temperature indication.

Action/Comment: Pulled the circuit breaker for more than an hour. Resumed normal system operation. The brake temperature monitoring logic card was replaced. Fairchild findings revealed a defective capacitor which inhibited the brake temperature function at high temperatures.

04/28/80 Cockpit Complaint: After touchdown before brake application, wheel #6 indicated LOW. Change from temperature to pressure mode indicated 163 psi readout. Performed system test but found normal. GO was indicated in the digital display.

Action/Comment: After parking, manual tire pressure check on ground provided 190 psi. Later check in cockpit provided 190 psi. This indicated a false warning.

04/29/80 Cockpit Complaint: After takeoff during climb-out, wheel #6 indicated LOW again. Pressure displayed was 157 psi. Wheel #5 showed 190 psi. Wheel #6 LOW light was on and off. Performed system test indicated normal.

Action/Comment: Manual ground check gave 190 psi wheel #6.

04/30/80 Cockpit Complaint: During climb and cruise, wheel #6 LOW pressure light illuminated again. Pressure indication was 165 psi. Test on system indicated normal.

Action/Comment: None.

05/01/81 Cockpit Complaint: During climb, wheel #6 LOW light was on. After 15 minutes, display showed 171 psi. After cruise for a period of time, tire pressure of wheel #6 rose to 185 psi.

Action/Comment: Tire pressure of wheel #6 was checked on ground. It showed 185 psi compared to the cockpit display panel readout of 177 psi. Wheel #6 was replaced. Pressure transducer was checked in the tire shop under different wheel pressure, but could not duplicate any problem.

05/01/80 Cockpit Complaint: Left nose wheel LOW tire pressure warning light was on during flight. Pressure indicated 161 psi on left nose wheel and 194 psi on right nose wheel.

Action/Comment: Manual ground check revealed 164 psi. It was found that the pressure in the left nose tire was below the limit for reinflation. This provided a justified low tire warning.

05/01/80 Cockpit Complaint: Since the Fairchild BTM/TPI system installation, there had been flight crew complaints about the update time for the brake temperature readout. An instantaneous readout was necessary. Also, the mode-select light/switch was presenting a brightness problem at daytime and nighttime.

Action/Comment: Fairchild improved the brake temperature monitoring system update time. In addition, the mode-select switch was modified so that blue light readout appeared in place of white light readout.

05/16/80 Cockpit Complaint: After cruising for 3 hours, wheel #4 LOW pressure warning light illuminated. Pressure indication was 152 psi. Wheel #3 showed 182 psi. During approach, wheel #4 pressure

indicated 130 psi.

Action/Comment: Replaced wheel #4. Manual ground check revealed pressure of 145 psi. This provided a justified low tire pressure warning. It was found that pressure in wheel #4 was below limit for reinflation.

06/11/80 Cockpit Complaint: After takeoff, left nose wheel provided LOW pressure illumination. Pressure readout was 7 psi.

Action/Comment: Manual pressure check was normal. Replaced the left nose wheel. Pressure transducer was checked but found normal. It was sent back to Fairchild for further fault analysis. Fairchild investigation revealed pressure transducer malfunctioned. Lead was broken off from the printed circuit board inside the pressure transducer. This provided intermittent low pressure warning. This indicated a false warning.

10/10/80 Cockpit Complaint: After landing, DIFF TEMP light indication was on. Brake temperature of wheel #1 read 276°C. Average brake temperature was 175°C. Depressing TEST switch provided normal system operation.

Action/Comment: It was found that a new brake was installed on wheel #1. It was hotter than the average brake temperature. Brake was allowed to cool down before the next flight. This provided a good indication of the system warning capability.

10/18/80 Cockpit Complaint: DIFF TEMP light illuminated. Brake temperature of wheel #5 read 340°C.

Action/Comment: Wheel and brake of #5 were checked, but found all normal.

10/29/80 Cockpit Complaint: Pressure portion of the mode-select light/switch was off.

Action/Comment: Replaced light bulb. System returned to operation.

11/04/80 Cockpit Complaint: During approach, wheel #8 LOW pressure light illuminated. Pressure readout was 138 psi.

Action/Comment: Manual ground check indicated 174 psi. Wheel #7 showed 200 psi. Since pressure difference between the two tires in the same axle exceeded 10%, Swissair decided to replace wheel #8.

11/06/80 Cockpit Complaint: LOW pressure warning light indicated on wheel #1. Pressure displayed was 2 psi.

Action/Comment: Pressure was checked with the tire fill value gauge. Normal pressure readout. Wrong cockpit indication caused false warning.

11/07/80 Cockpit Complaint: "F1" displayed in the test mode. No low tire pressure warning light appeared. After 10 minutes on the ground, LOW light illuminated on wheel #1.

Action Comment: Manual pressure check revealed 185 psi in wheel #1. It was found normal as compared with other wheels. This provided an unacceptable false warning.

11/12/80 Cockpit Complaint: Wheel #1 LOW pressure warning light was on intermittently. Pressure read 4 psi. Depressing and releasing the TEST switch showed "F1."

Action Comment: None.

11/12/80 Cockpit Complaint: Tire pressure on wheel #1 was unserviceable.

Action Comment: Replaced wheel #1. Removed the pressure transducer and interchanged the hubcaps on wheels #1 and #5.

11/15/80 Cockpit Complaint: No tire pressure indication.

Action Comment: Tire pressure indicating system was

normal again during cruise.

11/16/80 Cockpit Complaint: Tire pressure LOW warning light on wheel #1 was on intermittently. Tire pressure indicated 135 psi.

Action Comment: According to maintenance check, actual pressure check by tire pressure gauge was 192 psi. Wheel #1 was replaced. Pressure transducer was replaced. Both pressure transducers removed on 11/12/80 and 11/16/80 were sent back to Fairchild for further failure analysis. Fairchild findings revealed broken lead within the pressure transducer. This caused the false warning indication.

12/05/80 Cockpit Complaint: During cruise, wheel #9 LOW pressure warning came on. Pressure indicated 174 psi. Wheel #10 displayed a pressures of 201 psi.

Action Comment: Manual ground check showed that pressures were normal.

12/06/80 Cockpit Complaint: During cruise, wheel #9 LOW pressure warning light came on. Pressure readout was 166 psi. Wheel #10 pressure showed 213 psi. Put system in TEST mode but found no peculiar problem.

Action/Comment: None.

12/06/80 Cockpit Complaint: Wheel #10 tire pressure fluctuated from 175 psi to 210 psi. This caused the LOW illumination of wheel #9 due to the differential pressure threshold of 15%.

Action/Comment: By means of a tire pressure gauge, wheel #10 read 166 psi. However, the tire pressure indication checked on the ground was normal.

12/09/80 Cockpit Complaint: After landing, wheel #10 LOW pressure light was on. Pressure was 128 psi. After taxi in, LOW light disappeared and pressure was normal again.

Action/Comment: Manual ground check provided a tire pressure readout of 155 psi on wheel #10.

12/09/80 Cockpit Complaint: Wheel #4 LOW pressure warning light was on after 5 hours in flight. Pressure indication dropped from 172 psi to 143 psi. All other wheels were operating normally. After landing, wheel #10 LOW pressure warning light was on.

Action/Comment: Replaced wheel #4 and wheel #10. Investigation on wheel #4 showed air leak at wheel/banjo bolt interface. It was believed that the unconventional type of sealing was the cause of the leakage. Wheel #10 gave unstable reading.

02/16/81 Cockpit Complaint: Wheel #10 tire pressure "LOW" light was on.

Action/Comment: Pressure indicated 138 psi for wheel #9 and 120 psi for wheel #10. Tire #10 was reinflated to the upper limit. Replaced wheels #9 and #10. Pressure transducer output of wheels #9 and #10 revealed the following:

- A. Static check found outputs of both transducers within limit.
- B. Knocked with plastic hammer on pressure transducer #10 provided readout within limit. However, pressure transducer #9 provided varying output. It appeared to be a connector problem. During transducer connection, indication changed. It became especially unstable when the lock nut of the connector was tightened. Later finding discovered the broken lead in the pressure transducer. This was identical to the previous failure. The pressure transducer manufacturer provided a modification which redesigned the lead termination. In addition,

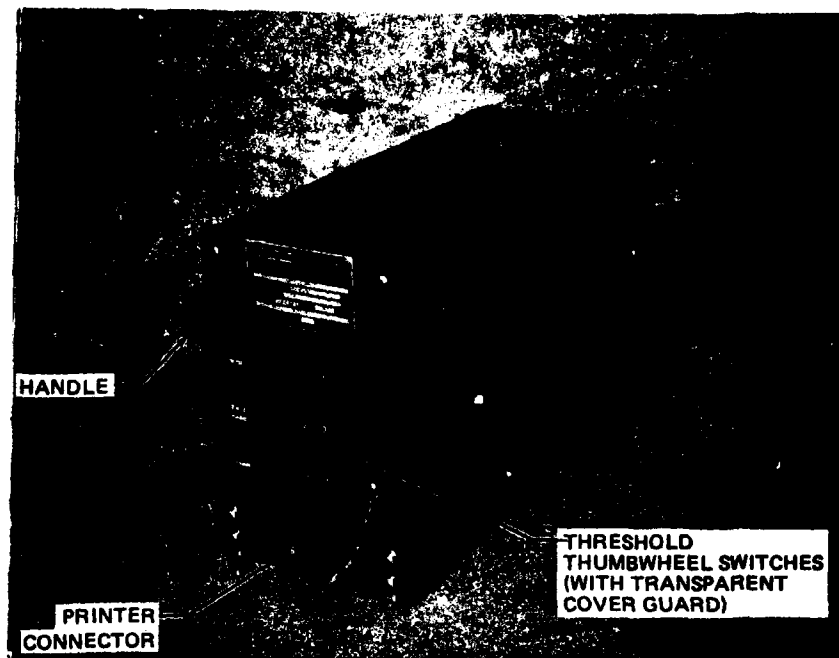
more flexible wires and silicone wafer were added to keep wires in place under high shock and vibration.

04/04/81 Cockpit Complaint: Temperature indications of wheels #3, #4, #7, #8, #9 and #10 were unreliable.

Action/Comment: Temperature indicated 500C too high on wheels #3, #4, #7 and #8. Wheels #9 and #10 were found normal.

APPENDIX C

FAIRCHILD SYSTEM INSTALLATION PROCEDURES



L114045

FIGURE C-1. BRAKE TEMPERATURE MONITOR/TIRE PRESSURE INDICATING SYSTEM COMPUTER



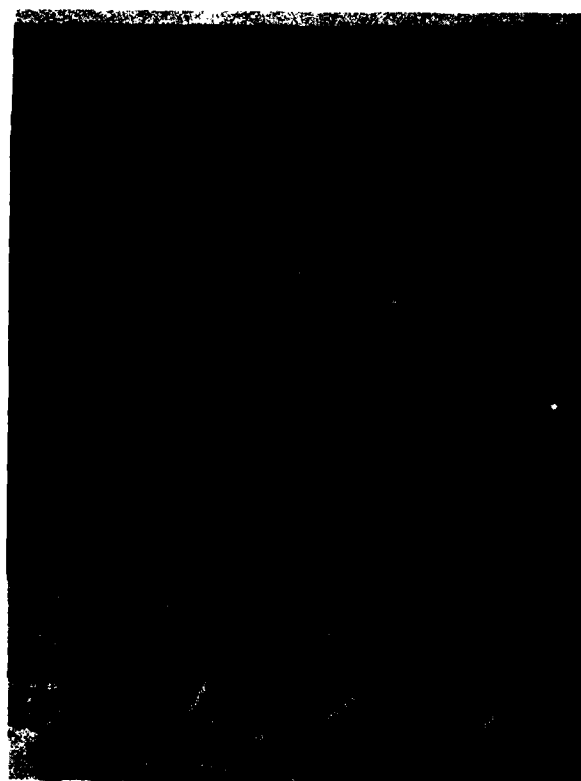
L114047

FIGURE C-2. BRAKE TEMPERATURE MONITOR/TIRE PRESSURE INDICATING SYSTEM COMPUTER



L114042

FIGURE C-3. SYSTEM IN PRESSURE MODE WITH A FAULTY CONDITION INDICATED



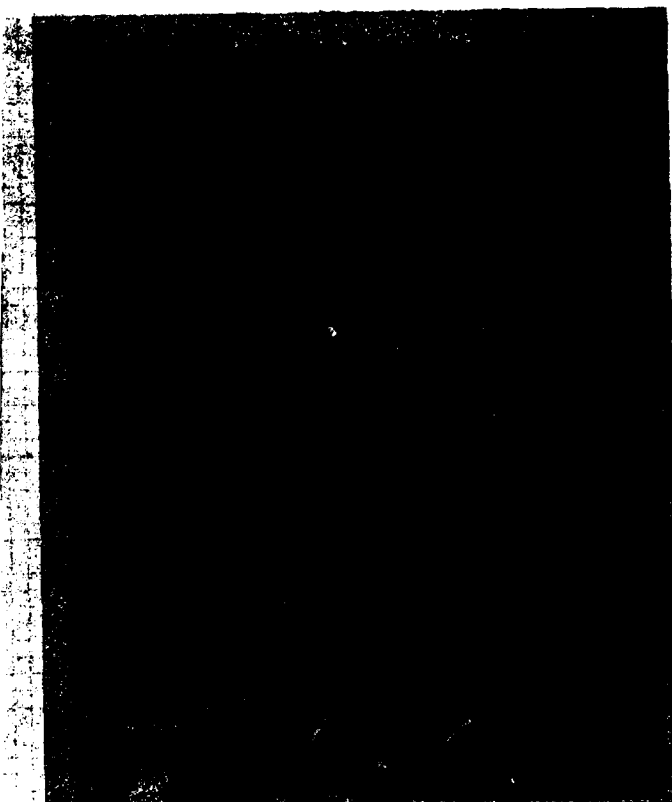
L114043

FIGURE C-4. SYSTEM IN TEMPERATURE MODE WITH A FAULTY CONDITION INDICATED



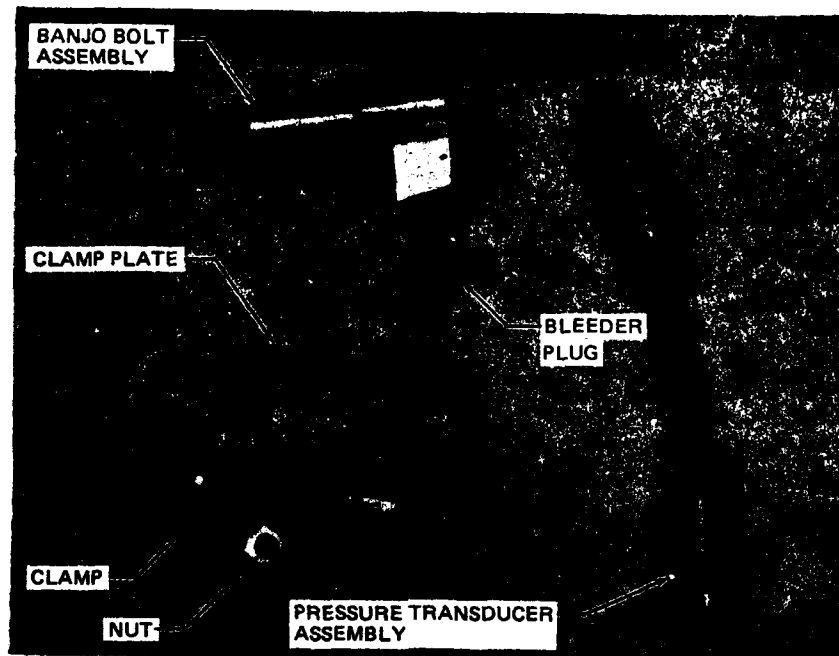
L114041

**FIGURE C-5. DEPRESSING TEST/FAULT SWITCH PROVIDES A LIGHTING CHECK
WITH FIGURE "888" DISPLAYED**



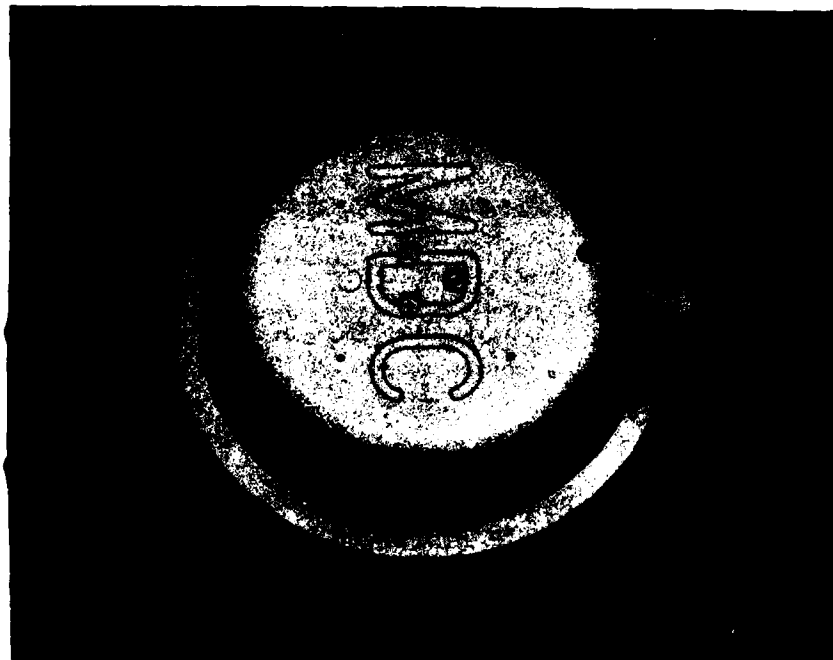
L114040

FIGURE C-6. SYSTEM IN TEMPERATURE MODE WITH HIGHEST BRAKE TEMPERATURE DISPLAYED



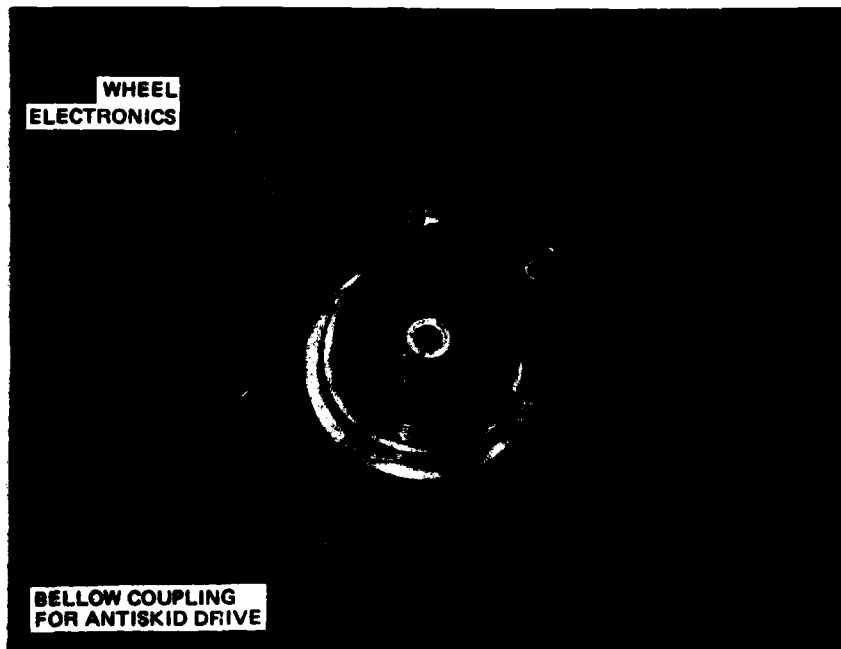
L112038

FIGURE C-7. MAIN WHEEL COMPONENTS



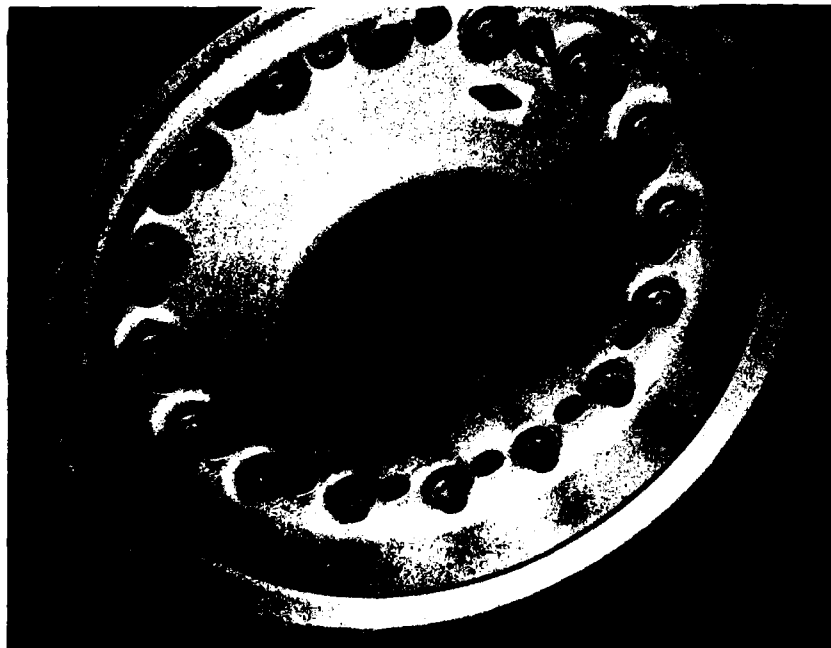
L113417

FIGURE C-8. MAINWHEEL ELECTRONICS AND HUBCAP ASSEMBLY
(EXTERNAL VIEW)



L113414

FIGURE C-9. MAINWHEEL ELECTRONICS AND HUBCAP ASSEMBLY (INTERNAL VIEW)



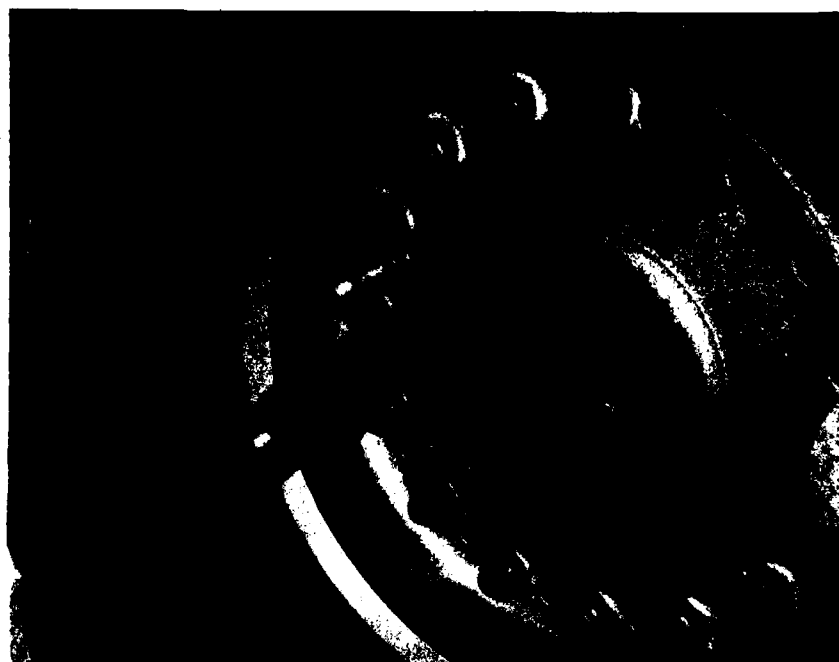
L112040

FIGURE C-10. STEP 1 - REMOVE PRESSURE RELEASE PLUG, TWO ADJACENT WHEEL NUTS AND WASHERS



L112042

FIGURE C-11. STEP 2 = INSTALL CLAMP PLATE



L112043

FIGURE C-12. STEP 3 = INSTALL BANJO BOLT ASSEMBLY



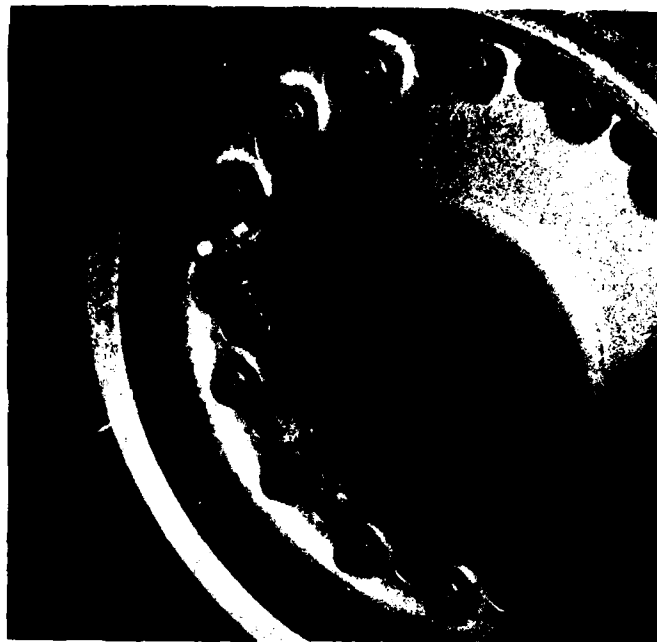
L112046

**FIGURE C-13. STEP 4 = REMOVE BLEEDER PLUG AND INSTALL PRESSURE
TRANSDUCER ASSEMBLY**



L112047

FIGURE C-14. STEP 5 = INSTALL CLAMP AND NUT



L112037

FIGURE C-15. STEP 6 = REINSTALL WHEEL NUTS AND WASHERS



L112032

FIGURE C-16. STEP 7 = REINSTALL PRESSURE RELEASE PLUG INTO THE BANJO BOLT ASSEMBLY



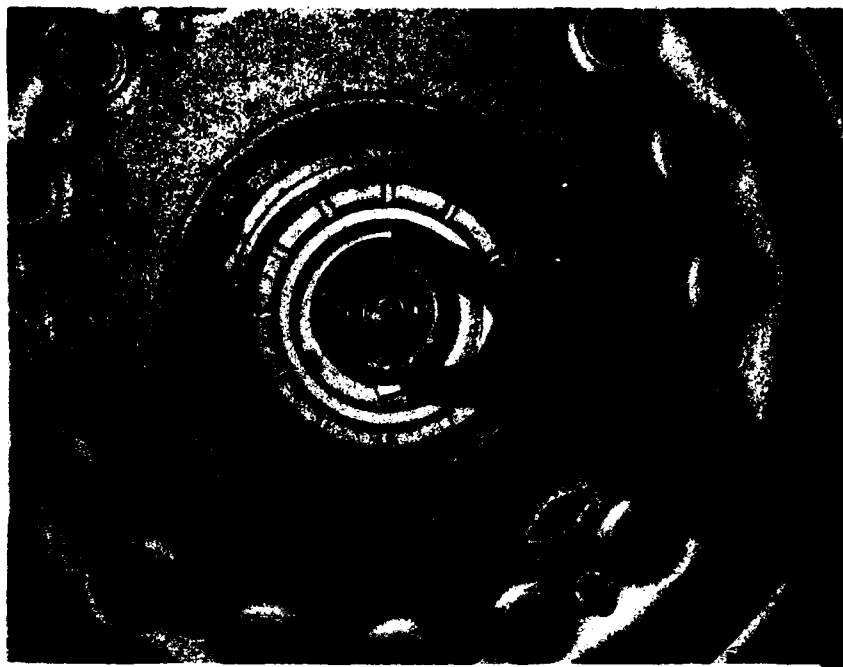
L112030

FIGURE C-17. STEP 8 = SAFETY-WIRE THE ASSEMBLY



L112150

FIGURE C-18. STEP 9 = INSTALL MODIFIED ANTISKID TRANSDUCER ADAPTER AND FIXED COIL ASSEMBLY



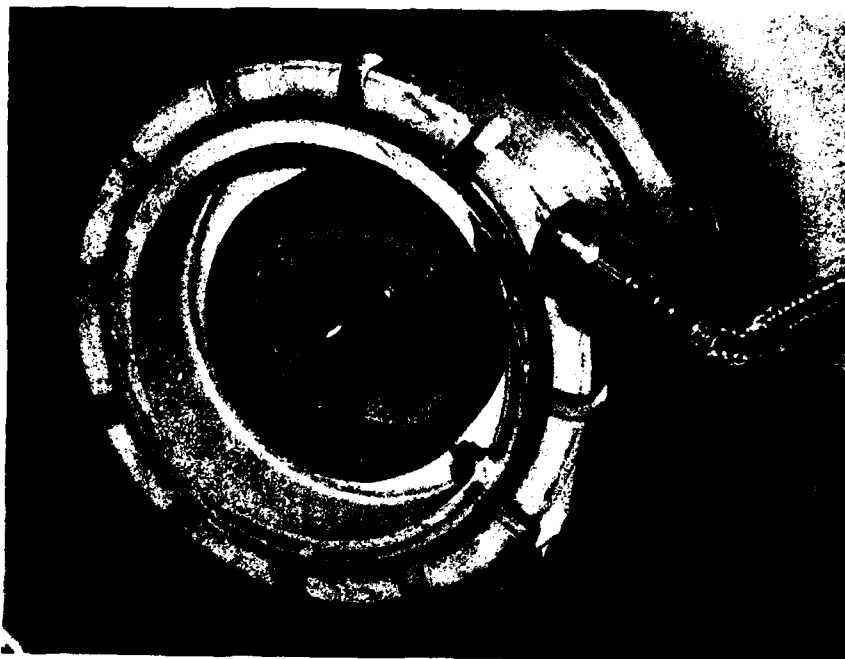
L112153

FIGURE C-19. STEP 10 = INSTALL MODIFIED ANTISKID TRANSDUCER



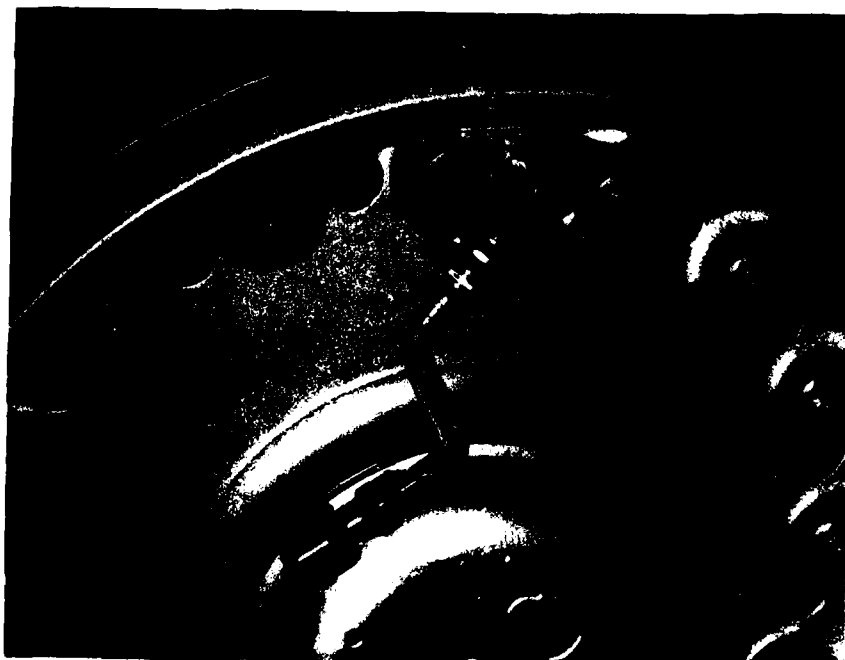
L112154

FIGURE C-20. STEP 11 = POSITION FIXED COIL ASSEMBLY CONCENTRIC TO ANTISKID TRANSDUCER SHAFT ADAPTER SPLINE BY MEANS OF A CENTERING TOOL



L113416

FIGURE C-21. STEP 12 = INSTALL THE THREE MOUNTING SCREWS



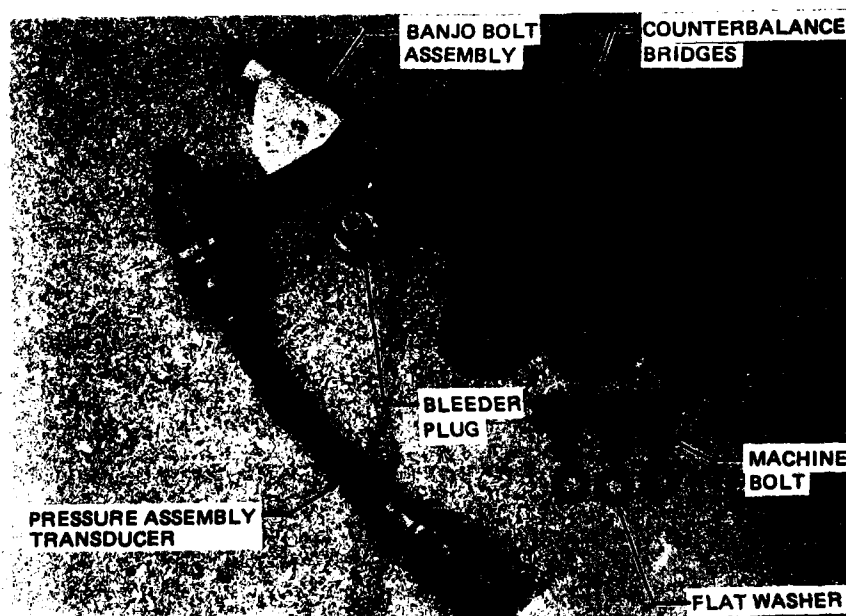
L113422

FIGURE C-22. STEP 13 = INSTALL MAINWHEEL ELECTRONICS AND HUBCAP ASSEMBLY. SECURE BY RETAINING CLAMP. ATTACH PRESSURE TRANSDUCER ASSEMBLY TO CONNECTOR ON HUBCAP AND SAFETY WIRE



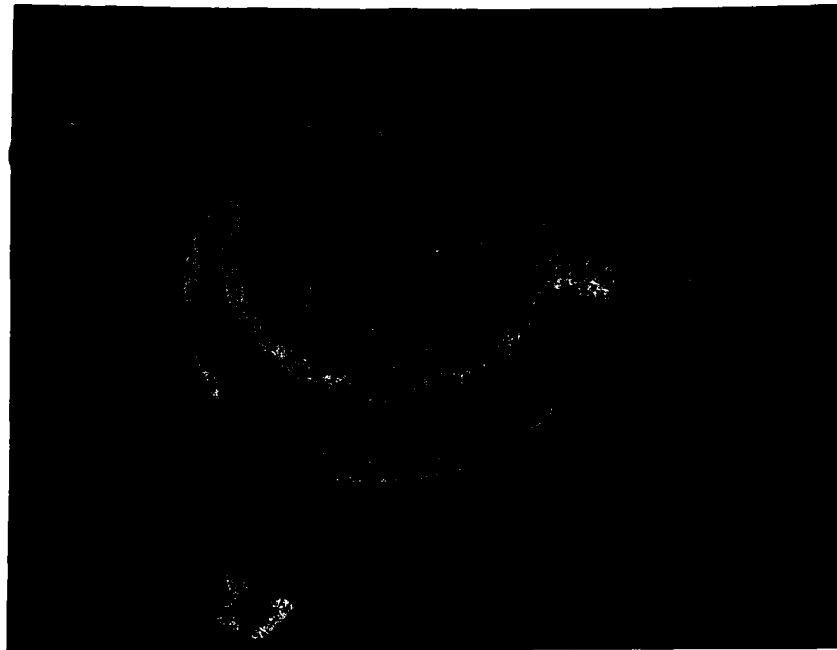
L113421

FIGURE C-23. MAINWHEEL CONFIGURATION WITH TPI HARDWARE



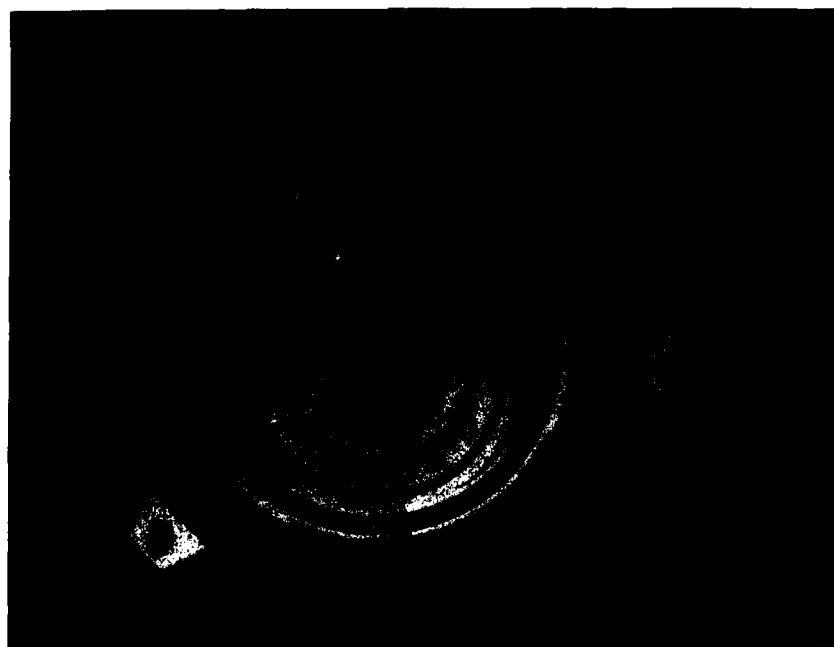
L113439

FIGURE C-24. NOSEWHEEL COMPONENTS



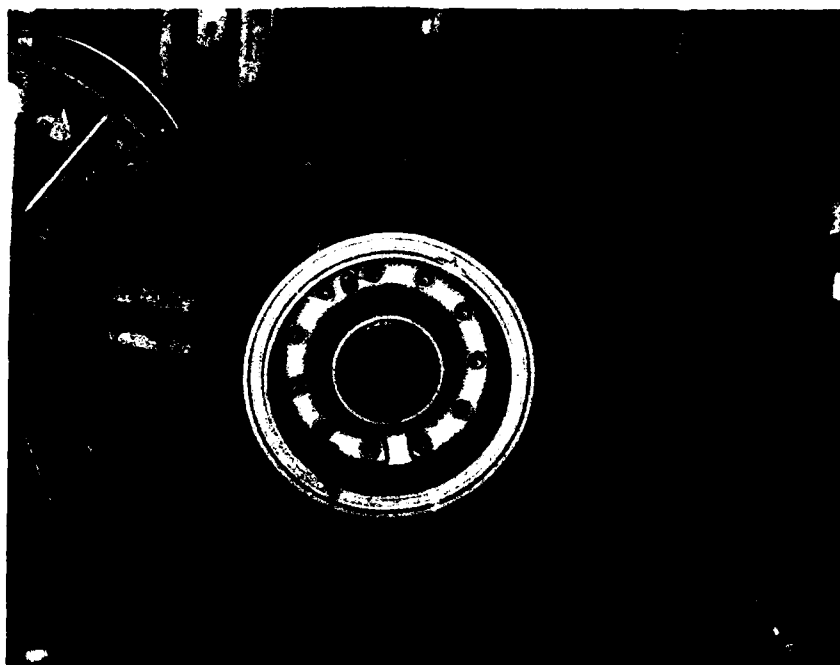
L113419

**FIGURE C-25. NOSEWHEEL ELECTRONICS AND WHEEL COVER ASSEMBLY
(EXTERNAL VIEW)**



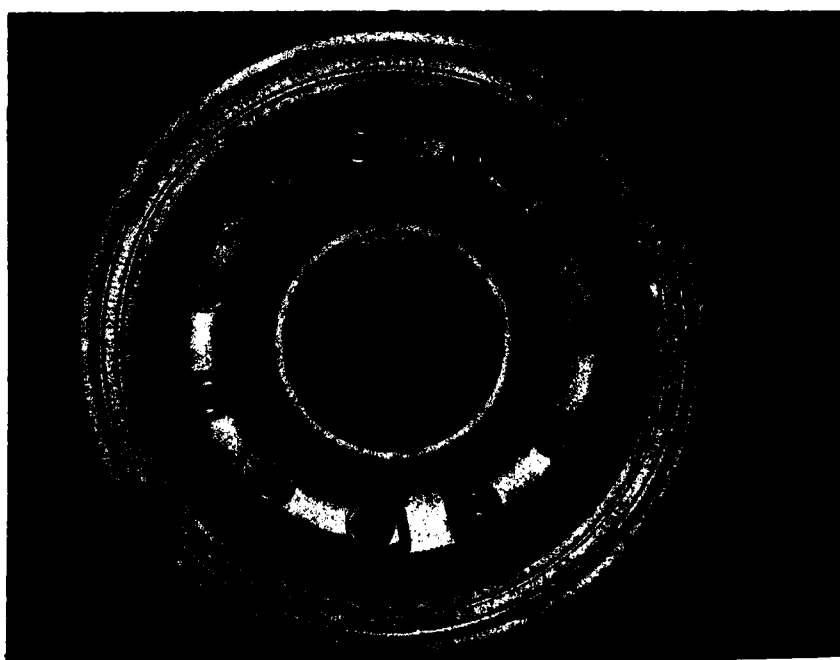
L113420

**FIGURE C-26. NOSEWHEEL ELECTRONICS AND WHEEL COVER ASSEMBLY
(INTERNAL VIEW)**



L112020

FIGURE C-27. STEP 1 = SET UP NOSEWHEEL



L112021

FIGURE C-28. STEP 2 = REMOVE SIX (6) WHEEL NUTS, SIX WASHERS, AND FILL VALVE ASSEMBLY

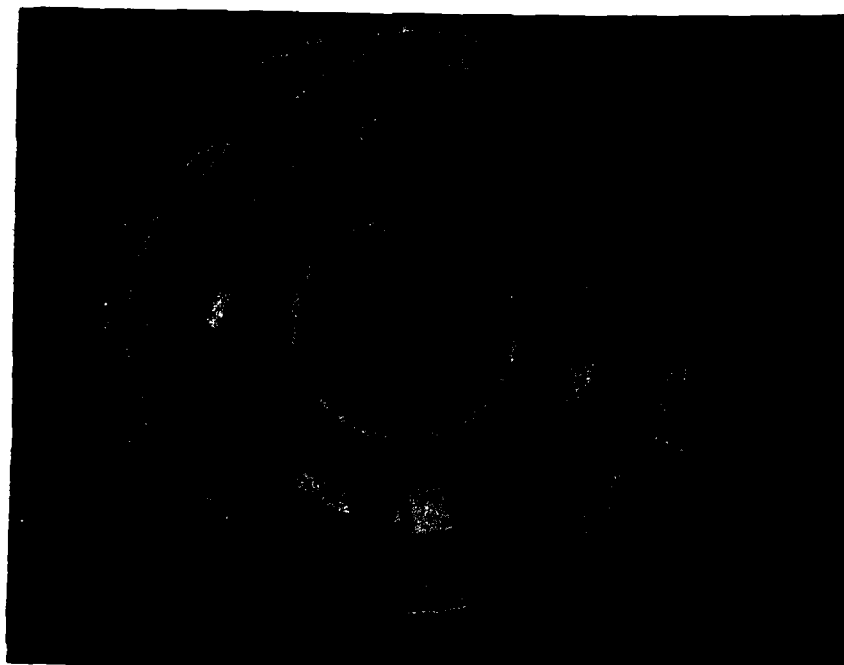


FIGURE C-29. STEP 3 = INSTALL COUNTERBALANCE BRIDGES. OMIT THE WASHERS AND INSTALL WHEEL NUTS

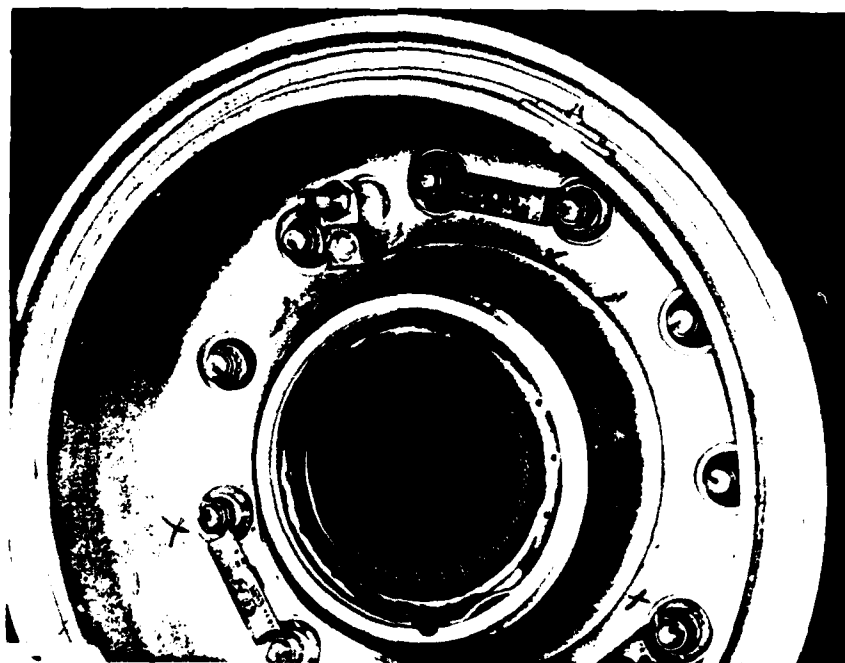
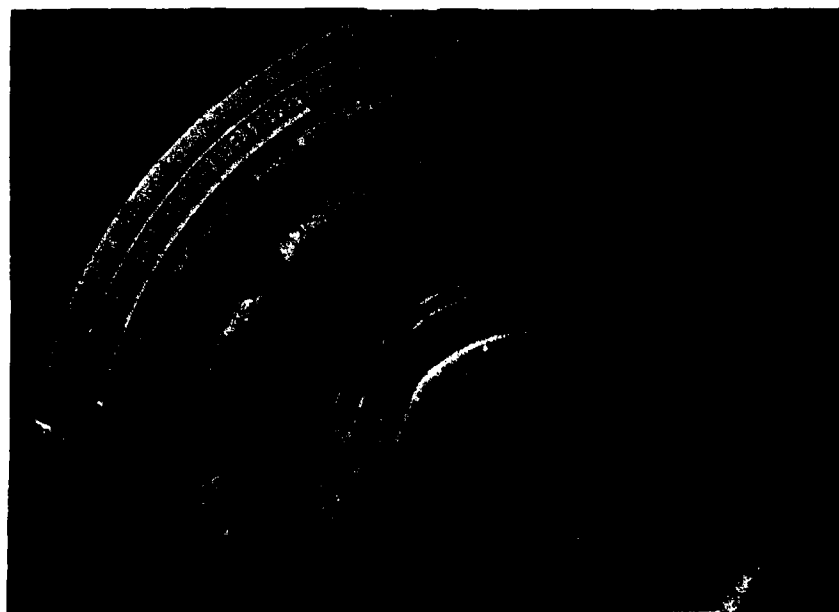


FIGURE C-30. STEP 4 = INSTALL BANJO BOLT ASSEMBLY



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FIGURE C-31. STEP 5 = INSTALL PRESSURE TRANSDUCER ASSEMBLY INTO THE BANJO BOLT ASSEMBLY AND SAFETY WIRE



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FIGURE C-32. STEP 6 = INSTALL FIXED COIL ASSEMBLY INSIDE THE AXLE. SECURE IN PLACE WITH JAM NUT ASSEMBLY. INSTALL NOSE-WHEEL ELECTRONICS AND WHEEL COVER ASSEMBLY. ATTACH PRESSURE TRANSDUCER ASSEMBLY TO CONNECTOR ON WHEEL COVER AND SAFETY WIRE



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FIGURE C-33. NOSEWHEEL CONFIGURATION WITH TPI HARDWARE

